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# The University of North Carolina Record

## RESEARCH IN PROGRESS

July, 1923—July, 1924

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# RESEARCH IN PROGRESS

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The following pages contain a record of such activities of the members of the Graduate School, both faculty and students, as are related to the advancement of learning. Publications of a general or popular nature and public addresses of the faculty are not included. Abstracts of dissertations of candidates for higher degrees are included, even when these dissertations have not yet been published, because such work comes within the field covered by this bulletin. The contents of the research publications issued by the University of North Carolna Press under the direction of members of the Graduate Faculty, and programs of the meetings of the research organizations will be found in an appendix.

With the current academic year two important additions to the facilities for research at the University will become available. The first of these is the income from $25,000 of the Smith Bequest which has been placed at the disposal of the Administrative Board for the furtherance of investigation by members of the Faculty. This endowment yields $1,500 annually and is immediately available. The second of these additions is the grant of $32,500 a year for three years from the Laura Spelman Rockefeller Memorial for the encouragement of cooperative research in social sciences. This fund is administered by a special Board of Governors and is to be used chiefly in the establishment of a series of research assistantships at stipends ranging from $750 to $1,500 annually. There is also provision for the publication through the University Press of the results of investigations carried on with the aid of grants from this fund.

During the year the special research fund established by the Trustees for the assistance of members of the Faculty who are carrying on special investigation was apportioned to thirteen projects. Such of these investigations as have been completed are described in the following pages; a brief table is appended for the purposes of record and reference.

EDWIN GREENLAW, *Dean.*

| PROJECT NUMBER | PROFESSOR | SUBJECT | AMOUNT |
|---|---|---|---|
| 28 | Dashiell | Measuring effects of a radical modification of the maze problem. | $ 78.00 |
| 29 | Dashiell | Investigation of the role played by mental set or adjustment. | 83.61 |
| 30 | MacNider | Drawings for monographs in research in pharmacology. | 175.00 |
| 31 | Knight | Copying documents in Southern educational history. | 25.00 |
| 32 | Wheeler | Manufacture of material used in special research. | 50.00 |
| 33 | Coker | Expenses for collecting material | 78.74 |
| 34 | Stuhlman | Special apparatus for further work on project 24. | 83.55 |
| 35 | Saville | Continuation of colloid investigation (project 26). | 185.75 |
| 36 | Howell, A. C. | Collecting and transcribing material in Library of Congress. | 50.00 |
| 37 | Thrall | Collecting and transcribing documents in Celtic literature and church history. | 100.00 |
| 38 | MacNider | Work in Library of the Surgeon General, Washington, D. C. | 50.00 |
| 39 | Coker | Collecting botanical material in Florida. | 71.26 |
| 40 | Crane | Supplementary grant for project 16 (free association reactions.) | 49.15 |

## DEPARTMENT OF ANATOMY

W. C. GEORGE. Some Peculiar Amoeboid Cells in the Blood of Perophora. *Journal of the Elisha Mitchell Scientific Society,* October, 1923.

The colonial ascidian, Perophora, has a unique type of amoeboid cell found in the blood and in the cellulose tunic. It is a vacuolated cell, the vacuoles having the appearance of compartments separated from one another by thin partitions of non-granular cytoplasm. Staining with methylene blue, neutral red and various other vital stains shows the presence in these compartments of minute granules which exhibit a very active Brownian movement. At times these granules may be seen to coalesce into curved rods and into larger irregular masses.

Studies in Ascidian Blood. *Proceedings of the North Carolina Academy of Science,* May 2—3, 1924.

There is considerable variation in the blood of different genera of ascidians. The blood of *Perophora viridis* contains five distinct types of cells with variations. These types are: (1) Green cells of a berry-like appearance consisting of a considerable number of green, fatty globules inbedded in a scant amount of clear cytoplasm. The nuclear region can be identified in the living cell as a clear area of cytoplasm in which there are no green bodies. (2) Orange cells. These cells have orange colored bodies of unknown nature inbedded in the clear cytoplasm of the cell body. (3) Colorless berry-like cells consisting of several opaque bodies imbedded in clear cytoplasm. The nucleus may be found in cytoplasm compressed between adjacent bodies. (4) Vacuolated amoeboid cells, clear, hyaline in appearance when alive and unstained. Methylene blue and various other vital stains show the presence of numerous fine dancing granules in their vacuoles. These cells may show many vacuoles or they may be a signet ring type of cell with only a single vacuole. (5) Granular amoeboid cells.

The Structure of the Heart Muscle of *Ascidia. Proceedings of the North Carolina Academy of Science,* May 2—3, 1924.

The heart of Ascidia is a tubular structure consisting of a muscular membrane a single cell thick. The cells of this membrane are elongated, lying parallel to one another and extending spirally around the tube. On the side of the cells next the cavity of the heart are located transversely striped coarse fibrils imbedded in the cytoplasm. The sides of the cells away from the cavity contain the nuclei and many vacuoles.

C. H. ASHFORD is engaged during the summer in a study of the cytology of the follicle and test cells of the egg of Ascidia. This work is being done at the Beaufort laboratory of the United States Bureau of Fisheries.

## DEPARTMENT OF BOTANY

W. C. COKER has completed the following papers during the year:

The *Geasters* of the United States and Canada. *Journal of the Elisha Mitchell Scientific Society,* 39:170-224. 1924.

This paper is accompanied by 16 photographic plates, two of microscopic detail, and one showing relationships in the genus. It includes all known species for the area covered, and several species from the West Indies.

A New Species of *Thraustotheca* (with J. N. Couch). *Journal of the Elisha Mitchell Scientific Society,* Vol. 39:112-115. 1923.

This paper describes the species *T. achlyoides* and has one plate of microscopic detail.

A New *Aphanomyces* Parasitic on Fungi (with J. N. Couch). Given before the North Carolina Academy of Science at Durham, N. C., May 3, 1924.

This new *Aphanomyces* is the second known species of the genus that is a parasite on fungi. Both are known only from Chapel Hill. The new species is distinguished from *A. parasiticus* (see Coker, *The Saprolegniaceae,* p. 165) by its habit of surrounding the host instead of entering it, and by the larger oogonia and eggs. Experiments show that the plant is able to parasitize various Phycomycetes even as remotely related as *Mucor* and *Pythium.* Ascomycetes are immune so far as tested.

A Revision of the Genus *Thraustotheca* with a Description of a New Species (with J. N. Couch). Given before the Botanical Section of the American Association for the Advancement of Science at Cincinnati, December 28, 1923.

The Mycenas of North Carolina (with H. C. Beardslee). *Journal of the Elisha Mitchell Scientific Society,* 40:July, 1924.

This includes all known species for the state and several extra-limital ones. There are 23 photographic plates and two of microscopic details.

The Gasteromycetes of the Eastern United States.

This book is nearly ready for the press and is expected to appear during 1924. It will contain many plates of photographs and microscopic details, and will include all known species of this large and varied group in the area covered.

J. N. COUCH has completed during the year:

Spore Formation and Discharge in Some Genera of Water Molds. *Journal of the Elisha Mitchell Scientific Society,* 40: July, 1924. Abstract given in *Research in Progress* for 1922-23, p. 67.

*Dictyuchus monosporus,* a Dioecious Water Mold. Given before the Botanical Section of the American Association for the Advancement of Science at Cincinnati, December 28, 1923.

*Pythium dictiospermum* and a New Species of *Achlyogeton* Parasitic on it. Given before the North Carolina Academy of Science at Durham, May 3, 1924.

Sexuality and Variation in the Genus *Dictyuchus.* Doctoral Dissertation.

A somewhat detailed account is given of an investigation in the method of reproduction and variability in the genus *Dictyuchus.* It has been found that the strains of *Dictyuchus* as collected in nature show certain variations which according to the general principles of classification in this group would permit the making of several species as has already been done.

In strains which were producing sexual fruits the antheridial and oogonial strains have been isolated and grown separately, under which conditions they invariably remain sexually sterile, but when the opposite strains are grown together so that their threads intermingle, oogonia and antheridia are formed in the region where the threads are in contact, thus proving the plant to be dioecious or heterothallic.

The opposite strains, with a few exceptions, of the apparently different species may be intercrossed, in which crosses variations occur in the size of the oogonia and eggs and in the character of the antheridia which invalidate any specific distinctions between the species *D. monosporus, D. magnusii, D. carpophorus,* and *D. sterile.*

In numerous crosses between the male and female strains of *Dictyuchus* and other molds, sexual stimulation occurred only between the female strain A. of *Dictyuchus* and *Thraustotheca primoachlya* in which cross the *Dictyuchus* formed oogonial initials and the *Thraustotheca* formed a superabundance of antheridial branches, the stimulation occurring only in the region where the threads of the two plants intermingled.

The eggs of *Dictyuchus* after a rest period of a month to six weeks become capable of germinating either into a short hypha which bears a single sporangium, or into a more or less branched mycelium.

Numerous eggs have been germinated and considerable experimentation has been carried on to find out when sexual segregation took place. It was found that partial sexual segregation may take place early in the egg germination so that parts of the mycelium may be male, parts female and parts may be mixed, or that segregation may take place at the formation of spores in the early formed sporangia in which part of the spores may be male, part female, and part mixed.

A. C. MOORE, Professor of Biology of the University of South Carolina, Exchange Lecturer for 1924, delivered the following lectures in Gerrard Hall, May 8-10, 1924:

Biological Mileposts.

The Part Botany has Played in Biological Progress and Some of the Things we may Expect in the Future.

The Pollination of Flowers, Illustrated.

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## DEPARTMENT OF CHEMISTRY

JAMES M. BELL has directed the following studies:

HORACE D. CROCKFORD has continued his work on the latent heats of fusion of the nitrotoluenes.

The quantity of heat required to melt unit quantities of different compounds is known for comparatively few substances and the exact determination of many of these quantities is urgently needed in the development of chemical theory. The work is supported by the American Academy of Arts and Sciences.

GEORGE M. MURPHY has studied the solubility in water of mercuric chloride in the presence of hydrochloric acid.

In many respects mercuric chloride is a very abnormal compound and its behavior in the presence of chlorides in which it might be expected to have a lower solubility, is quite abnormal.

SAMUEL S. MURRAY has studied in a preliminary way the lowering of the freezing point of solutions containing both hydrochloric acid and mercuric chloride.

Alvin S. Wheeler and S. C. Smith.

The Constitution of Dichlorohydroxy-ethylidene-bis-nitroanilines. *Journal American Chemical Society,* 45, 1839 (July, 1923).

Abstract given in *Research in Progress* for 1923, p. 8.

Alvin S. Wheeler and J. L. McEwen.

Hydroxynaphthoquinone Studies VI. The Chlorination of Juglone. *Journal American Chemical Society,* 45, 1970 (August, 1923).

Alvin S. Wheeler and S. C. Smith.

Direct Conversion of Derivatives of Dichloroacetic Acid into Derivatives of Trichloroacetic Acid. *Journal American Chemical Society,* 45, 1994 (August, 1923).

Abstract given in *Research in Progress* for 1923, p. 9.

Alvin S. Wheeler and E. W. Constable.

The Bromination of 2-Amino-p-xylene and Certain New Azo Dyes. *Journal American Chemical Society,* 45, 1995 (August, 1923).

Abstract given in *Research in Progress* for 1923, p. 10.

Alvin S. Wheeler and C. R. Harris (Progress on Ph. D. Thesis).

The Nature of High Boiling Constituents of Spruce Turpentine.

The residues left after distilling off the p-cymene in spruce turpentine are under investigation. A fractional distillation was carried out and all fractions except one were found to be liquid. The fraction boiling at 80°-90° at 3 mm. pressure solidified in colorless hexagonal plates. The following points were worked out: formula, $C_{10}H_{18}O$; molecular weight, 154; melting point, 205°; index of optical rotation, -12° 43′; best purified from petroleum ether; gave a phenylurethane melting at 141°; gave on oxidation with nitric acid camphor, melting at 176°-177° and further identified by its semicarbazoone melting at 241°-242°. These facts prove that the crystalline fraction consists of a mixture of racemic and levo-borneol.

ALVIN S. WHEELER AND F. P. BROOKS.

The Action of Phenylsemicarbazide on Acetylacetone. (Progress on Ph. D. Thesis).

The reaction between phenylsemicarbazide and acetylacetone was carried out according to the method of Posner. The product was separated into two compounds by recrystallizing from alcohol. About eighty-five per cent consisted of white needles, melting at 68-70°. The other product had a much higher melting point. Analysis of the main product indicated the new compound, 1-phenylcarbamyl-3,5-dimethylpyrazole. Its alcoholic solution treated with ammoniacal silver nitrate gave a silver compound, $AgN_2C_5H_7$, showing loss of the phenylcarbamyl group. Removal of silver with hydrochloric acid gave 3,5-dimethylpyrazole, identified by its picrate, melting at 165°. The original product gave with bromine a bromohydrobromide, white plates melting at 260.°

FRANK C. VILBRANDT WITH E. V. KYSER.

Formulae for Potassium-Free Soft Soaps. *Chemical Age.* XXXI, 381, 1923.

This study was taken up at the request of the National Research Council as one of a series for substituting sodium for potassium compounds in the preparation of technical products. A systematic study of mixtures of several fats, oils, sodium compounds, and other minor substances brought forth several desirable formulae, less expensive than the old formulae products at no sacrifice of quality.

FRANK C. VILBRANDT WITH E. V. KYSER.

Preliminary Report on the Effect of Fatty Acids on Liniments and Emulsions. *Journal American Pharmaceutical Association,* XIII, 433, 1924.

This is one of a series of studies on the effect of the formation of soluble soaps by the action of alkalies, their salts and soluble silicates on free fatty acids in fixed oils. The amount of soap formed by such action is capable of forming emulsions of different viscosities depending upon the percentage of free acid and the alkali used.

FRANK C. VILBRANDT WITH H. J. BANKSTON, JR.

Influence of Solvents on the Iodine Values of Fats and Oils. *Journal of Industrial and Engineering Chemistry,* July issue, 1924.

The influence of such solvents as chloroform, carbon tetrachloride, ether, ethyl alcohol and benzene that have been used interchangeably in practice was found to change materially the Hanus iodine value of fats and oils.

Chloroform and carbon tetrachloride gave higher and more uniform values than were obtained when ether, benzene or ethyl alcohol were used. Chloroform was found to be the superior solvent for this determination.

FRANK C. VILBRANDT.

Chemical Industries of North Carolina. *Journal of Industrial and Engineering Chemistry,* August 20, 1924; also *Journal of the Elisha Mitchell Society,* XXXIX, 76, 1923.

Abstract given in *Research in Progress* for 1923, p. 8.

FRANK C. VILBRANDT AND W. E. GILES. (Progress on Ph. D. Thesis).

The work this year has included a further study of other coals in the Deep River Coal field than that abstracted in *Research in Progress* for 1923, p. 11. A correlation of the low temperature distillation results of these coals has revealed the variability of coking products and coking results one encounters with the coals of this field, which vary in composition quite materially in the different slopes of the mines. Proper handling of these variable coals will constitute one of the industrial problems, should this coal be utilized for by-producting on the large scale.

PROFESSOR VILBRANDT presented the following paper before the Elisha Mitchell Society embodying some experimentation directed by him:

Thermal Evaluation of Byproducting Deep River Valley Coals. November 13, 1923.

Abstract given in *Research in Progress* for 1923.

The following papers embodying studies carried out by Professor Vilbrandt were presented before the North Carolina Section of the American Chemical Society, May 3, 1924, Durham, N. C.

A New Correction Tube for Gas Burets.

A new type of gas buret compensation tube has been perfected by Mr. Vilbrandt, which embodies the principle of the Peterssen tube but is more compact, less fragile, easier of manipulation, less expensive and more flexible than the former. Its smallness and ruggedness permits its installation upon portable gas apparatus.

Devitrification of Laboratory Quartzware and the Remedy.

Micro-photographical studies were made of fused and transparent quartzware subjected to the variety of conditions met with in a chemical laboratory and the progress of the deterioration studied. The devitrifica-

tion begins as a surface deterioration and can be checked by dissolving away the checked or caked silica, by hydrofluoric acid treatment. Neglect causes deeper checking and devitrification, resulting in the cracking of the silica ware and its destruction.

PROFESSOR VILBRANDT has the following investigations under way:

1. Lead Chromate pigments (with E. M. Rollins).
2. The Unsaturation Constants of Fats and Oils (with C. W. Flintom).
3. Some Critical Points of Emulsification in Oil Soap Emulsions (with E. V. Kyser).
4. New Bleaches for Cottonseed Oil (with H. J. Bankston, Emory University).

The following theses were approved by the Department of Chemistry in 1923-24:

1. Doctoral dissertation by Haywood M. Taylor (under the direction of Alvin S. Wheeler):

The Bromination of 2-Amino-p-Cymene and Certain New Azo Dyestuffs.

When 2-amino-p-cymene is brominated in the cold one hydrogen is replaced by one bromine atom. This involves a question in orientation. It is known that in the nitration of 2-amino-p-cymene the nitro group enters position 2, ortho to the methyl group. When this compound is reduced 2-amino-p-cymene is obtained. This is then acetylated in order to protect the amino group and the product treated with bromine in a carbon tetrachloride solution at ordinary temperature. It is theoretically possible to place the bromine either in the side chain or in the cymene nucleus. Entrance into the side chain is at once eliminated since the compound has none of the characteristics of the aliphatic halogen compounds and since the bromination was carried out at ordinary temperature. Of the position in the ring which the bromine may occupy, there are three, namely: positions 3, 5, or 6. Two lines of attack were adopted for the determination of its position.

First: the acetyl derivative of the bromo-amino-p-cymene was oxidized with neutral potassium permanganate. Analysis for bromine and titration with alkali indicated the compound formed to be a monobasic acid and furthermore, a cuminic acid melting at 217°C. The acetyl group was removed by treating with conc. hydrochloric acid, forming the bromo-amino-cuminic acid hydrochloride, melting at 191-2°C. Upon hydrolysis with sodium hydroxide a free amino acid is obtained which melts at 166-7°C and which is identical with the known 2-amino-5-bromo-p-cuminic acid melting at the same point. By the Sandmeyer reaction this compound was further converted into the 2-5-dibromo-p-cuminic acid, melting at 149°C.

Secondly: the brominated amine was treated with conc. hydrobromic acid forming the hydrobromide which melts at 200°C. This compound was diazotized and the amino group replaced by a bromine atom by means of the Sandmeyer diazo reaction, forming a dibromo cymene, which was then oxidized in a sealed tube with nitric acid (sp.gr. 1.12), forming a compound which titration with potash indicated to be dibasic. Thus we have formed a dibromo-terephthalic acid, melting at 314-5°C which is identical with the 2-5-dibromoterephthalic acid the structure of which is known. This acid was further converted into the diethyl ester, melting at 124-5°C which is identical with the known diethyl ester of 2-5-dibromo-terephthalic acid.

Since the amino group occupied position 2 in the cymene nucleus and since it was replaced by a bromine atom the bromine must enter the same position. Since this compound upon oxidation gives a 2-5-dibromo-terephthalic acid the other bromine must be at position 5 in the cymene nucleus. Thus it is proved that in the bromination of 2-amino-p-cymene in the cold the bromine atom enters the ring at position 5.

This orientation has produced the following new compounds: *2-Acetamino-5-bromo-p-cymene,* melting at 122.5°C, needles from alcohol. Made by the action of bromine upon 2-acetamino-p-cymene, in carbon tetrachloride solution at room temperature. *2-Amino-5-bromo-p-cymene hydrochloride,* melting at 205°C with decomposition, silvery hexagonal plates from alcohol. Made by the action of conc. HCl upon the 2-acetamino-5-bromo-p-cymene. *2-Amino-5-bromo-p-cymene hydrobromide,* melting at 200°C with decomposition, brilliant octagonal plates from alcohol. Made by the action of conc. HBr upon the 2-acetamino-5-bromo-p-cymene. *2-Amino-5-bromo-p-cymene,* boiling at 169-70°C at 20 mm. It is a colorless oil which rapidly becomes dark and finally red like amiline. It is soluble in ether, alcohol, and acids and is insoluble in water. Made by hydrolyzing the hydrochloride of 2-amino-5-bromo-p-cymene with conc. hydrochloric acid.

## NEW DYES

By diazotizing the 2-amino-5-bromo-p-cymene hydrochloride and coupling with phenols the following new dyes have been made. The dyes are all very fast to light and show varying fastness to other tests. Their exhaustion is excellent and they exhibit great brilliancy. The brilliancy was shown to be due to the bromine atom.

*2,4(5-bromo-carvacryl-disazo)-phenol,* from hot glacial acetic acid, flat long needles melting at 212°C. It shows a beautiful bronze luster and an Argus Brown color. It is a developed dye giving an Empire Yellow on wool and a Maize Yellow on silk. *4(5-bromo-carvacrylazo)Resorcinol,* an amorphous powder melting at 202°C, Claret Brown in color from hot ligroin. It is a developed dye giving a Primuline Yellow on wool and a golden yellow on silk. *2,6(5-bromo-carvacrylazo)-Thymol,* rectangular plates melting at 249°C, Vandyke Brown in color from hot ligroin. It is a developed dye giving a light Cadmium color on wool and a brilliant buff yellow on silk.

*2,4(5-bromo-carvacryldisazo) 1-naphthol,* bronze needles melting at 228° from boiling ligroin. It is a developed dye giving an Old Rose on wool and a reddish gold on silk. *1(5-bromo-carvacrylazo) 2-naphthol,* prisms melting at 168-9°C, rose red in color with a bronze metallic luster from hot acetone. It is a developed dye giving a Flesh Ocher on wool and an Orient Pink on silk. *4(5-bromo-carvacrylazo)-1-naphthol-2-sulfonic acid,* microscopic needles melting at 238°C, Garnet Red in color from hot alcohol. It is an acid dye giving a deep reddish orange on wool and a deep eosin pink on silk. *2(5-bromo-carvacrylazo)-1-naphthol-4-sulfonic acid,* microscopic needles melting at 285°C, Spectrum Red in color from hot alcohol. It is an acid dye giving a Spectrum Red on silk and wool. *1(5-bromo-carvacrylazo) -2-naphthol-7-sulfonic acid,* fine needles melting above 325°C and scarlet in color from hot glacial acetic acid. It is an acid dye giving a Scarlet Red on wool and silk. *1(5-bromo-carvacrylazo)-2-naphthol-6-sulfonic acid,* fine needles decomposing between 300-350°C and scarlet in color from hot alcohol. It is an acid dye giving a scarlet on wool and silk. *2(5-bromo-carvacrylazo)-1-8-dihydroxy-naphthalene-3-6-disulfonic acid,* microscopic needles melting at 269°C, purplish red in color with a bronze luster from alcohol. It is an acid dye giving a Bordeaux on wool and an Amaranth Purple on silk. *1(5-bromo-carvacrylazo)-2-naphthol-3-6-disulfonic acid,* microscopic needles melting at 330°C, carmine in color from hot alcohol. It is an acid dye giving a deep scarlet red on wool and a light Begonia Rose on silk.

## 2. ALVIN S. WHEELER AND R. W. BOST. Master's Thesis, 1924. p-Tolylsemicarbazide and Certain Derivatives.

There are two possible p-Tolylsemicarbazides. Previous investigators describe the one having the formula: $CH_3C_6H_4NHNHCONH_2$, where the tolyl radical is substituted in the hydrazine radical. The other form has the formula: $CH_3C_6H_4NHCONHNH_2$, in which the tolyl radical is substituted in the amino group. We are the first to prepare this latter compound. The object of this research was to find a way to prepare this compound and to study its action in forming condensation products with certain important ketones.

The p-Tolylsemicarbazide was prepared according to the following scheme: p-Toluidine + HCl; p-Toluidine hydrochloride + $CO\begin{matrix}NH_2\\NH_2\end{matrix}$; p-Tolylurea + $(NH_2)_2H_2O$ = p-Tolylsemicarbazide. The p-Toluidine hydrochloride consisted of light yellow crystals, melting at 232°-234°. The p-Tolylurea was purified by dissolving in hot glacial acetic acid and filtering into cold water, white glistening plates, melting at 184°. The *p-Tolylsemicarbazide* was purified by passing it through its hydrochloride; silky white glistening plates, melting at 157°-159°.

p-Tolylsemicarbazide yields the following derivatives: (A) *Acetone-p-Tolylsemicarbazone,* white needles, having the form of prisms, melting at

205° with decomposition, recrystallized from alcohol. (B) *Acetophenone-p-Tolylsemicarbazone,* white flocculent needles, melting at 163°, recrystallized from alcohol. (C) *p-Quinone-p-Tolylsemicarbazone,* brown leaflets having a shining lustre, melting at 165°, recrystallized from alcohol. (D) *Camphor-p-Tolylsemicarbazone,* white needles, melting at 225°-229°, recrystallized from alcohol. (E) *Benzophenone-p-Tolylsemicarbazone,* white needles, melting at 162°, recrystallized from alcohol. All of the above compounds are new substances.

3. ALVIN S. WHEELER AND E. DEW. JENNINGS. Master's Thesis, 1924.

## The Action of Dichloracetic and Trichloracetic Acid on Amines.

This investigation was undertaken to determine the limit of the reaction between aniline and dichloracetic acid in which there was a conversion of the dichloracetic acid into monochloracetic acid and trichloracetic acid, the latter adding on to the amine to form the trichloroacetate. This conversion reaction as published by Wheeler and Smith does not apply to the following substituted amines: methylaniline, 2-4-dichloraniline, ortho-chloraniline, benzidine, anisidine, and p-aminophenol. In the reactions of Wheeler and Smith the dichloracetate could only be obtained at 0°. In the reaction studied in this work the dichloroacetate was obtained regardless of temperature, excess of one reagent or reacting medium, when the dichloracetic acid is used.

When these amines were treated with trichloracetic acid trichloroacetate was formed.

When the amine was treated with either acid there was always an evolution of heat and on cooling a crystalline solid formed.

*Dichloroacetate of methylaniline,* $C_6H_5NHCH_3CHCl_2COOH$. Fine needles, slightly yellow, melting at 85°. Purified by $CCl_4$. *Trichloroacetate of methylaniline,* $C_6H_5NHCH_3CCl_3COOH$. Fine white needles melting at 97°. Purified by $CCl_4$. *Dichloroacetate of ortho-chloraniline,* $C_6H_4ClNH_2$-$CHCl_2COOH$. White granular crystals, melting at 69-70°. Purified by alcohol. *Trichloroacetate of ortho-chloraniline,* $C_6H_4ClNH_2CCl_3COOH$, needles when first crystallized and plates from $CCl_4$, melting at 120°. Purified by $CCl_4$. *Dichloroacetate of 2-4 dichloraniline,* $C_6H_3Cl_2NH_2CHCl_2COOH$. Short microscopic needles, melting at 138°. Purified by toluene. *Trichloroacetate of 2-4-dichloraniline,* $C_6H_3Cl_2NH_2CCl_3COOH$. Octahedral crystals, melting at 123-124°. Purified by chloroform. *Dichloroacetate of ortho-anisidine,* $C_6H_4OCH_3NH_2CHCl_2COOH$. Extremely fine colorless needles, melting at 96°. Purified by alcohol and chloroform. *Trichloroacetate of ortho-anisidine,* $C_6H_4OCH_3NH_2CCl_3COOH$. Large needles, melting at 141°. Purified by 95% alcohol. Dichloroacetate of benzidine, $NH_2C_6H_4C_6H_4NH_2(CHCl_2$-$COOH)_2$. Reaction in alcoholic solution. Crystals very light fine leaves, melting at 203°. Purified by alcohol and benzene. *Trichloroacetate of*

*benzidine,* $NH_2C_6H_4C_6H_4NH_2(CCl_3COOH)_2$. Reaction in alcoholic solution. Very fine and leaf-like crystals, melting at 166°. Purified by 95% alcohol. *Dichloroacetate of para-aminophenol,* $C_6H_4OHNH_2CHCl_2COOH$. White needles, melting at 148° (decom.). Purified by alcohol and $CCl_4$. *Trichloroacetate of para-aminophenol,* $C_6H_4OHNH_2CCl_3COOH$. White crystalline solid, melting at 166°. Purified by alcohol and $CCl_4$.

4. ALVIN S. WHEELER AND MILDRED MORSE. Master's Thesis, 1924.

## The Chlorination of 2-Amino-p-Xylene and Certain New Azo Dyes.

Chloro-amino-p-xylene was prepared in 1874 by Paul Jannasch, and in 1889 by P. Kluge, by the reduction of nitro-xylene but no attempts were made to locate the chlorine atom.

In this research the acetyl derivative of 2-amino-p-xylene was chlorinated at 16° in glacial acetic acid forming chloro-2-acetamido-p-xylene. Proof of the constitution of the compound was worked out as follows: the chloro-2-acetamido-p-xylene was hydrolyzed by hydrochloric acid, and the product treated with alkali thus obtaining 5-chloro-2-amino-p-xylene, m.p. 92°. On diazotization of its hydrochloride and subsequent steam distillation with cuprous chloride 2-5-dichloro-p-xylene, m.p. 71°, was formed. This, when heated to 180° C with nitric acid (sp. gr. 1.13) for 8 hours, gave 2, 5-dichloroterephthalic acid, m.p. 305°, a compound of known constitution, thus locating the chlorine atom in position 5.

A series of azo dyes was prepared by coupling phenols with the diazonium chloride of 2-amino-p-xylene. *4(5-chloro-2-p-xylylazo)phenol,* $(CH_3)_2C_6H_2ClN_2C_6H_5OH$. Microscopic brownish-yellow needles melting at 223°. Colors wool an orange buff, silk a maize yellow, and cotton a light buff. *4(5-chloro-2-p-xylylazo)resorcinol,* $(CH_3)_2C_6H_2ClN_2C_6H_3$. Microscopic orange-red needles melting at 220° Colors wool a Sudan brown, silk a gold, and cotton a Capucine buff. *4(5-chloro-2-p-xylylazo)1-naphthol,* $(CH_3)_2C_6H_2ClN_2C_{10}H_6OH$. Fine dark red needles melting at 163-164°. Colors wool a Sudan brown, silk an apricot buff, and cotton a cinnamon color. *1(5-chloro-2-p-xylylazo)2-naphthol,* $(CH_3)_2C_6H_2ClN_2C_{10}H_6OH$. Fine scarlet-red needles melting at 165°. Colors wool a Mars orange and silk a cinnamon. *2,6(bis-5-chloro-2-p-xylylazo)thymol,* $((CH_3)_2C_6H_2ClN_2)_2C_6HC_3H_7CH_3OH$. Dull brown microscopic needles melting at 290°. Colors wool an orange buff, silk a maize yellow and cotton a pale peach. *1(5-chloro-2-p-xylylazo)2-naphthol-6-sulfonic acid,* $(CH_3)_2C_6H_2ClN_2C_{10}H_5OHSO_2OH$. Fine dark-red needles melting above 360°. Colors wool a Grenadine red, silk a flame-scarlet, and cotton a strawberry-pink.

The following dyes have been prepared but analyses have not been completed: *2(5-chloro-2-p-xylylazo)1-naphthol-5-sulfonic acid,* $(CH_3)_2C_6H_2ClN_2C_{10}H_5OHSO_2OH$. Microscopic dark brownish-red needles melting above

360°. Colors wool a Nopal-red, silk a carmine, and cotton a deep rose. *2(5-chloro-2-p-xylylazo)1-8-dihydroxy-3-6-disulfonic acid,* $(CH_3)_2C_6H_2ClN_2C_{10}H_3(OH)_2(SO_2OH)_2$. Dark purplish-red powder melting above 360°. Colors wool a spectrum-red, silk a spectrum-red, and cotton a rose-pink. *2(5-chloro-2-p-xylylazo)1-naphthol-1-4-disulfonic acid,* $(CH_3)_2C_6H_2ClN_2C_{10}H_5OHSO_2OH$. Brilliant red powder melting above 360°. Colors wool a spectrum-red, silk an eosin-pink, and cotton an eosin pink.

## 5. J. T. DOBBINS AND J. H. MOURANE. Master's Thesis, 1924. The Action of Arsenic Trichloride on Diethylaniline.

When arsenic trichloride in ether solution is added to diethylaniline dissolved in ether an immediate precipitation of a white compound takes place. Upon analysis this compound is shown to correspond to the formula, $AsCl_3.3C_6H_5N(C_2H_5)_2$.

The action of benzene solution of arsenic trichloride on aniline in benzene solution gives a compound, $AsCl_3.3C_6H_5NH_2$, which corresponds to the work of J. H. Schmidt (*Journal American Chemical Society,* 43, 2451, 1921). This indicates the action of arsenic trichloride on primary and tertiary amines is the same nature. As there is no hydrogen left in the amine group of the diethylaniline which may be substituted, the reaction in both cases is most likely one of direct addition and not of substitution as some authors claim.

It is noted in using the Robertson Method for Arsenic (*Journal American Chemical Society* 43, 182-5, 1921) that the amount of sulfuric acid used and volume to which the solution is evaporated has an appreciable effect upon the amount of arsenic found.

## 6. J. M. BELL AND H. G. PICKETT. Master's Thesis. (1923). A Study of the Nitration of the Ortho-Nitrotoluene.

Ortho-nitrotoluene was treated with a nitrating mixture of nitric and sulfuric acids. The per cent of the isomers of the dinitrotoluene present in the product was determined by thermo-analysis. The product contained 70% of the 2-4 dinitrotoluene and the other 30% was nearly all the 2-6 dinitrotoluene.

Nitration of ortho-nitrotoluene in the presence of certain metalic salts. It was found that some salts vary the percentage of isomers formed.

Ortho-nitrotoluene was nitrated to trinitrotoluene and the reaction was 92% complete.

Nitration of toluene in the vapor phase was attempted and work in this field is being continued.

## DEPARTMENT OF CIVIL ENGINEERING

T. F. HICKERSON completes his tables and methods of dealing with *curves* as applied to highway location and design, with the following conclusions:

(1) If the external distance is limited and the tangent distances are unlimited, the best alignment both from the standpoint of economy and aesthetic appearance, is a transition spiral extending all the way around the bend.

(2) If the external distance is limited and the tangent distance is limited in one or both directions, the alignment may necessarily consist entirely of a circular curve, but it should preferably have easement spirals connecting each end with the tangents.

In order to give a sufficient degree of flexibility to fit the variety of conditions that occur in practice, formulas and tables have been derived for the following cases: (a) Where spiral angle $= \frac{\Delta}{2}$ and the two spirals are tangent to each other at a point opposite vertex of curve; (b) Where spiral angle $= \frac{3\Delta}{10}$; (c) Where spiral angle $= \frac{2\Delta}{10}$; (d) Where spiral angle $= \frac{\Delta}{10}$.

In the preliminary survey of a highway, the curve may be run as a circular arc, but in the final location (especially in the case of hard surface construction) it should be run as a spiral. In order to facilitate this operation, tables have been compiled giving the increase in approach tangent distances for any type of spiral with the *same* external distance as that of a circular curve. When therefore a spiral is substituted for a circular curve, the position of the road opposite the vertex is unchanged, and it is only a matter of finding where the spiral begins. The data given in the tables on the basis of equivalent external distances are remarkably uniform for large ranges in the deflection angle.

It is the practice now among engineers to widen the roadway around sharp curves. This extra area of road surface forms a "lune" of various shapes depending upon the type of curve used and the point where the widening starts. The writer has derived exact formulas for every case of widening and compiled tables giving the necessary coefficients.

All computations have been made and checked with great care by the use of eight-place logarithms, ten-place natural functions and a calculating machine.

THORNDIKE SAVILLE, R. L. DEARSTYNE AND J. H. WULBERN have carried on the first investigation of stream pollution to be made in North Carolina. The streams being investigated are Little and Moccassin Creeks in Wake County, which receive the sewage from the Town of Zebulon. Studies of Total Bacteria,

Fecal and non-Fecal B. coli, Protozoa, Bio-Chemical Oxygen Demand and Dissolved Oxygen are being made at a number of sampling stations. The investigation will be carried through an entire year, making semi-monthly analyses.

Thorndike Saville and O. E. Martin with G. W. Smith have completed a Water Power Investigation of Deep River, to be published as an Economic Paper of the North Carolina Geological and Economic Survey. This is the first complete river survey of an entire stream, already partially developed to be made in the South. The study included river profile, cross sections of selected dam sites, storage and silting investigations, estimates of power, steam auxiliary, and interconnection of plants.

Thorndike Saville and G. Wallace Smith have continued work on the preparation of a Bulletin on Stream Flow in North Carolina, to be issued by the North Carolina Geological and Economic Survey.

Thorndike Saville and J. H. Wulbern have continued the investigations reported on last year, on rainfall in North Carolina. A progress report was made in a paper before the North Carolina Academy of Science in Durham in May.

Thorndike Saville has made a report on Flood Flows on the Cape Fear River System, for the State Highway commission to be used in connection with the design of openings under bridges. This will be published as a Bulletin of the North Carolina Geological and Economic Survey.

Mr. Saville has published:

Relation Between Engineering Education and Engineering Ethics. *Bulletin of the Society for the Promotion of Engineering Education,* June, 1924.

Joseph George Wardlaw, Jr. and Luther Bachman Aull, Jr. Master's Thesis, 1924.

An Experiment for the Determination of Vertical Earth Pressures on Culvert Pipes.

These experiments were carried out on a private road about a mile out of Chapel Hill. The object of the experiments was to determine how much pressure earth fills exert on culvert pipes located under the road. The plan for determining these loads consisted in recording the pressures that are

transmitted to four 30-inch diameter cast iron pipes placed in such a manner that a fill of various heights can be constructed over them. Each of these pipes rested on a steel column which in turn rested on a weighing scale with a capacity of 30,000 pounds. The scales and columns are housed in a reinforced concrete room which has been built under the proposed road. A slot in the top of the room is just large enough to admit the pipe, which lies in a horizontal position, with one half of its surface protruding above the top of the room and exposed to the earth fill to be placed on it, the other half of the surface is inside of the room and resting on the columns. As each foot of the fill was placed and thoroughly rolled, the pressure of the earth on each pipe could be accurately determined by weighing the load that was registered to each scale.

The experiments included pressures from various classes of soils, such as sand and clay, with varying heights of fill. It is also contemplated to determine the pressure on the pipes due to the various methods of laying them.

In conjunction with these tests, experiments are being carried out to determine the coefficients of friction and cohesion of various soils, according to the ideas of Major William Cain as outlined in the *Transactions of the American Society of Civil Engineers,* Vol. LXXXVI, 1923.

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## DEPARTMENT OF COMPARATIVE LITERATURE

The following thesis was submitted by May Belle Penn, for the degree of Master of Arts: A Comparative Study of the Similes of the *Divine Comedy* and the *Aeneid.*

This thesis undertakes a study of the Homeric simile as it is found in the *Aeneid* and the *Divine Comedy.* The purpose of such a study is to ascertain to what extent Dante in his use of similes was guided by Virgil whom he acknowledged to be his master.

The similes of the two poems were classified and examined with respect to resemblances and dissimilarities of method and subject.

From such a comparison it was concluded that: (1) The similes of the two poems show such a kinship as characterizes the Homeric simile in general—the conventional themes and the function of ornament. (2) Dante's similes are in general more realistic than Virgil's. (3) In spite of widespread opinion to the contrary a close comparison shows no significant specific verbal imitation of the similes of the *Aeneid* in those of the *Divine Comedy.* (4) Although the similes of the *Divine Comedy* reflect in spirit Dante's saturation in the art of Virgil they do not reveal a technical relationship to the similes of the *Aeneid.*

A classified alphabetical index of the similes of the *Aeneid* and the *Divine Comedy* is contained in an appendix to the thesis.

The following thesis was submitted by Edward Payson Willard, Jr., for the degree of Master of Arts: The Influence of Horace upon Herrick's *Hesperides.*

The influence of Horace is to be seen all through the *Hesperides,* and the purpose of this thesis is to pick out the various imitations of the Latin poet which are to be found in these poems of Herrick, and to make a general and complete comparison of the thoughts of the two poets, bringing in the Horatian ideas that can be found in the *Hesperides*—to determine in a word what part Horace played in the composition of these poems.

The paper is divided into four main parts, as follows: 1. The general background of Horace's influence in English poetry up to the time of Herrick. 2. A comparison of Horace and Herrick along certain definite lines of thought, as follows: attitude toward metaphysics; ideas on time, death, change, etc.; the formation of a system of practical philosophy (the 'carpe diem' idea, the 'golden mean' as one of the basic rules of life); ethics (the upright man and just), praise of the simple life; contempt of wealth; life in the country; superstitions; attitude toward religion; folk customs and festivals; convivial poems; love poems (attitude toward love, frailty of youth and beauty); poems on poetry (attitude toward poetry, its immortality and power to confer immortality). 3. A list of imitations of Horace on various subjects which are not included in the preceding section. 4. A discussion of some of the general Roman elements met with in the *Hesperides,* not necessarily Horatian.

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## DEPARTMENT OF ECONOMICS AND COMMERCE

WALTER J. MATHERLY has published the following study:

The Why of Stock Dividends. *The University Journal of Business,* December, 1923.

A study concerning the nature of stock dividends and the reasons for their appearance in such large volume during 1922. An examination of the theory of stock dividends with regard to clarifying the problem of their taxation under the Federal Income Tax Law.

Studies in progress.

The Changing Character of Business Ownership in the United States.

This study has just been completed and deals with the trend toward the corporate form of organization in the ownership of American industry. Attention is directed to the growing number of stockholders of American corporations as evidence of a tendency toward mass ownership.

## Humanizing Forces in Industry.

A study of the human element in industry. An attempt will be made to evaluate the human effects of the various present-day movements in industry purporting to better the lot of the workers, and restore the human relation in modern industrialism.

The following theses for the Master's degree were approved:

## ROLAND BYERLY EUTSLER. A History of the Cape Fear and the Yadkin Valley Railway.

The purpose of the study is to show the place of an east and west railroad in North Carolina, its relationship to other carriers, and its probable effect as a competitive factor.

The Cape Fear and Yadkin Valley Railway system was the outgrowth of efforts to build an east and west railroad across the State of North Carolina. It was chartered in 1852. Construction was begun immediately but moved slowly for a period of thirty-one years. Many difficulties and obstacles were encountered. The project was held together by means of aid received from the State. The North State Improvement Company took over the work of construction in 1883. The system was completed in 1890, and runs from Wilmington to Mt. Airy with several important branches. Its total mileage is 364 miles.

As a direct result of the panic of 1893, the company was placed in the hands of a receiver. At the close of the five-year period of the receivership, the properties were purchased on joint account by the Atlantic Coast Line Railway and the Southern Railway. Contrary to the court decrees and to a statute of North Carolina, the properties of the old Cape Fear and Yadkin Valley were then divided among the two roads which purchased it.

This sale and dismemberment was investigated by the North Carolina Corporation Commission. The facts disclosed were used as the basis of a suit instituted in Wake Superior Court by the State of North Carolina for the purpose of having the sale and dismemberment set aside.

The Cape Fear and Yadkin Valley, conceived of as a single system, was an important carrier. It was the longest independent carrier in the State and carried large volumes of freight in competition with the Coast Line and the Southern. It crosses at right angles three large north and south systems and has direct connection into the middle west and into the north. It serves an important section of North Carolina and should be an important transportation agency.

The source materials used in this study were minutes of stockholders meetings, officers reports, court records, Corporation Commission reports and the laws of North Carolina. Secondary source materials were histories of North Carolina, pamphlets, material covering the development of other roads in the State, court decisions, and newspapers.

MAXWELL G. PANGLE. Profits and Their Relation to the Business Cycle.

This thesis is an attempt to discover the relationship between general profits and the causes producing industrial cycles. From the findings, it endeavors to formulate certain proposals looking to business stabilization.

From the study of both primary and secondary data contained in the libraries of the University, certain conclusions have been reached. Profits are extremely sensitive to changes in economic conditions at all times. They begin to decline earlier than other variables in business during a period of increasing prosperity. Profits vary first and most widely in those industries which produce production goods and raw materials.

These findings indicate that the crisis is brought about by a decline in profits for industries producing for consumption. During a period of increasing prosperity, the problem is to reduce costs because the profit margin is more or less narrowed on the cost side by swollen prices of production goods, excessively high wages, and relatively inefficient labor.

The decline of industrial activity in one class of industries seems to bring about an enforced crisis in the other. Hence the slump is not the result of a "Buyers' Strike." This belief is further supported by the data which show that there is a fairly well sustained purchasing power for retail goods even during a crisis. Also the accumulation of profits does not withhold from circulation any funds which go to make up this purchasing power.

The further conclusion is reached that to stabilize business, it is necessary to regularize only that class of industries producing for consumption. It is proposed that such industries accumulate large amounts of undivided profits in order to maintain dividend payments during a dull period. These profits may take the form of more commercial paper than is now held. Also, if corporations would carry more government, state, and county bonds, they would cause a shift in demand and, by encouraging public construction, tend to sustain the market for raw materials.

It is also proposed that, by limiting expansion and output to an amount proportionate to the secular trend, industries should be able to maintain both prices and employment, thus breaking the force of a crisis.

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## DEPARTMENT OF EDUCATION

EDGAR W. KNIGHT published during the past year *Education in the South* (Macmillan), a treatment of the development of public education in the southern states during the past twenty-five years, which also appeared in a volume entitled *Twenty-Five Years of American Education,* prepared in collaboration

with other scholars. He has also published (in collaboration with Assistant Superintendent Cloud of the San Francisco schools) *Our Constitutions, National and State* (Scott, Foresman and Company).

Mr. Knight is also continuing the preparation of his *Readings in Southern Educational History,* mentioned in earlier reports, and is at work on *The Influence of the Labor Movement on Public Education in the United States.*

M. R. TRABUE has served as Director of the Bureau of Educational Research which formally began operation in the School of Education at the University of North Carolina on July 1, 1923. The funds available for the work of this bureau during the past year have been so limited as to make it impossible to publish more than two reports in the series entitled "Studies in Education," but several reports have been published in important educational magazines, and a considerable number of mimeographed bulletins have been issued and sent to school officials in all parts of North Carolina.

Standard educational test materials have been distributed throughout the state, in many cases the number of copies of a single test running to twenty or thirty thousand. Superintendents, principals, supervisors, and teachers in practically every county of the state are beginning to assume toward their problems the attitude of research and to call upon the Bureau of Educational Research at the University for guidance and suggestions. Some of the studies conducted by these officials under the guidance of the Bureau are as important and as worthy of note as those worked out in Chapel Hill and mentioned below. Space is given here, however, to only those studies for which the Bureau of Educational Service is directly responsible.

HARRY F. LATSHAW. The Lohr-Latshaw Latin Form Test for High Schools. *Studies in Education,* No. 1, October, 1923.

This volume contains a report of the standardization of a Latin form test developed by Mr. L. L. Lohr. The thirty-five Latin forms selected by Mr. Lohr were arranged and printed by Mr. Latshaw in a form convenient for testing purposes. The test was then administered to 714 pupils in sixteen fairly typical North Carolina high schools. Eight of these were located in the eastern part of the state, five in the western, and three in the central section.

The test papers were carefully marked, and tabulations were made to show not only the total score of each pupil but also the frequency with which each Latin form was correctly identified. The percentages of correct responses were converted statistically into fractions of a normal probability integral. The differences in difficulty between the forms to be identified having been determined in this manner, the words were rearranged in the order of their difficulty, from easy to hard, and the test blanks were then printed for general use.

The median number of correctly identified forms was found for second, third, and fourth year high school pupils in those North Carolina communities where the test was administered. The maximum score would be 35, if each form had been correctly checked. In January the second-year pupils had a median of 10, the third-year pupils a median of 13, and the fourth-year pupils a median of 15. This amount of improvement is so small as to suggest that perhaps the elimination of the pupils who are less capable in Latin may account for the higher scores found in the higher classes.

Test blanks, stencils for finding and marking errors in the pupil's work, record sheets, and instructions for using the tests have been published separately and are for sale to school officials by the Bureau of Educational Research at cost together with a limited number of copies of the monograph describing the standardization of the test.

## M. R. TRABUE. Educational Achievements of North Carolina's Seventh Grade Pupils. *Studies in Education,* No. 2, June, 1924.

The following standard tests were applied in February, 1923, to thirteen hundred pupils in the seventh grades of the public schools in all sections of North Carolina:

1. Power to answer increasingly difficult questions about printed paragraphs. (Thorndike-McCall Reading Scale, Form 4.)

2. Power to spell increasingly difficult selections from the most important English words. (Selected test, H to AF, from Ayres Spelling Scale.)

3. Quality of original English compositions. (Marked by three separate judges on Hillegas' Scale.)

4. Power to solve increasingly difficult problems in the four fundamental operations of arithmetic. (Woody's Scales in Arithmetic, Series B.)

5. Quality of handwriting used in writing English compositions. (Marked by three separate judges on Thorndike's Scale.)

6. Age in years at last birthday.

7. General academic power or "intelligence test." (Mentimeters.)

North Carolina and a few other Southern states assume that pupils who complete the seven-grade school system are as well prepared for high school work as are pupils in other states who have completed an eight- or a nine-year system. The scores made by the thirteen hundred seventh-grade pupils,

taken for the most part from the best school systems in the state, indicate that our average product is not only below the national eighth-grade level but that it is even below the lowest national level for entering the seventh grade. In other words, when compared on the basis of actual achievements in the subjects mentioned above, our average North Carolina pupils graduating from the elementary schools are two years behind pupils graduating from elementary schools in the average state. Not all our schools are that far behind, but the majority of them are in an even worse condition. Some of our schools graduate their pupils from the elementary grades with abilities which would not average up well with pupils entering the fourth grade in other parts of the country.

## M. R. TRABUE. The Achievements of North Carolina High School Seniors.

The following standard tests were applied in February, 1923, to nine hundred pupils graduating from twenty-five accredited high schools in North Carolina:

1. Power to read increasingly difficult paragraphs and to answer increasingly difficult questions regarding these paragraphs. (Thorndike-McCall Reading Scales, Form 4.)

2. Quality of English used in writing an original composition. (Graded on Hillegas' Scale by three separate judges.)

3. General academic power as indicated by scores on a so-called "intelligence test." (Mentimeters.)

4. Age in years at last birthday.

5. Number of months pupil has attended school since entering primary grades. (This is essentially a measure of the educational opportunities with which pupils have been provided.)

The results of this study show that in reading ability the average high school senior in North Carolina is about three-fourths of a year behind the high school seniors of the average state. Several schools show better scores in reading than the average state, while several other North Carolina schools show results even below the standards for graduation from elementary schools. One high school senior class showed an average score two and one-half years below the standard for elementary school graduation.

The average senior in North Carolina, according to this study, is one and two-thirds of a year lower than the national average in the quality of the English compositions written. A few schools show results superior to the national average, but several are five or six years below this standard.

The same wide variation in results was found in the other tests applied. In one school the average senior had enjoyed 94 months of school training before beginning his last year in high school, while in another high school the average senior had obtained only 53 months of schooling. The national standard for school opportunity before entering the senior class is eleven

years of nine months each. We cannot hope to obtain as high results from pupils in North Carolina with only 50 or 60 months of training as other states obtain in 90 or 100 months. The seniors who had enjoyed only 53 months of opportunity for an education had an average age of 19.8 years. If pupils entered the first grade at 6.5 years of age and made regular progress through the grades, they should be graduating from our North Carolina high schools at age 17. Two of the twenty-five high schools achieved that result, approximately, but the average pupil was three-fourths of a year older. In three schools the average senior was more than 19 years of age. It is quite evident that the extremely wide differences in the achievements of seniors in North Carolina are the result chiefly of differences in the educational opportunities they have enjoyed.

## G. W. MANN. Selective Influence of Desire to Attend College.

Each high school senior in the study described above was asked to indicate where he expected to attend college. The ages and scores on the different tests were then tabulated according to the replies made to this question. The youngest group, and at the same time the group making the highest scores in the tests, were those who planned to go to Harvard, Yale, Princeton, etc. The next highest group were those planning to attend Salem College, most of whom were from the R. J. Reynolds High School in Winston-Salem. The third group were those planning to attend the University of North Carolina. The fourth group were planning to attend State College in Raleigh. The fifth group looked forward to a group of miscellaneous colleges, while the sixth group were hoping to attend the North Carolina College for Women.

The oldest group made the lowest scores in the tests and stated that they had decided not to attend college. The next to lowest group in the tests were uncertain whether they would attend college or not. Throughout the entire study it was apparent that those who knew their own abilities had looked forward and chosen rather wisely the colleges which would suit their academic capacities.

## A. C. HOLLAND. Some Relations Between Abilities and Vocations.

The seniors in the twenty-five high schools and the thirteen hundred seventh-grade pupils mentioned in the above studies were each asked to record the occupations of their parents. The seniors were also asked to indicate the occupations into which they planned to go after completing their educational preparation. The scores in the various tests were tabulated according to the replies given to these questions. The highest distributions were for children of teachers and other professionally trained groups. The lowest distributions were for the children of laborers, carpenters, and farmers. It was discouraging, however, to discover that those seniors planning to enter teaching were less brilliant in the tests than those planning to enter law, engineering, business, medicine, and the like.

The most important finding of this study was that our public school system as at present organized is actually taking people out of agriculture, trade, transportation, and industry, and turning them toward professional work. Not a single senior admitted that he intended to enter agriculture, although 16% of them came from farm homes. The fathers of 61.4% of the seventh-grade pupils, and of 58.1% of the seniors were engaged in trade and manufacturing, but only 17.2% of the seniors were looking in that direction. The fathers of 15.2% of the seventh-grade pupils, and of 4.8% of the seniors were engaged in transportation, but none of the seniors were willing to state that their ambitions led in that direction. Only 4.3% of the seventh-grade pupils were from professional homes, but 10.8% of the seniors were from such homes, and 69.5% of those seniors who have made a decision were planning to enter the "learned professions."

## A. R. REEP. The Relative Difficulty of the Various Grades in North Carolina Public Schools.

More than half of the elementary school pupils in North Carolina are below the fourth grade. There seems to be more failure and repetition in the first and second grade than in any other grades. This study attempts to compare the various grades as to difficulty of securing promotion from them. Seventh-grade pupils and high school seniors were asked to indicate just how many terms they spent in each of the elementary school grades. From their replies it was found that more pupils skip the second grade than any other grade and that, as measured by the percentage of seventh-grade pupils who skipped each grade, the seventh grade is most difficult, the sixth next, the fifth next, and so on back to the first and third which tie for next to the easiest place. Those pupils who fail in the early grades tend to leave school before having an opportunity to try the later and more difficult grades.

In this study it was found that the median seventh-grade pupil had spent considerably more than seven years in doing the seven grades of work, but that the median senior had spent almost exactly seven years in doing the work of the seven elementary grades. In other words, the seven-grade elementary school is too difficult for the average pupil who completes only the elementary course, but it is "just right" for the average pupil who is able to go forward and complete a high school course. Considerably less than 50% of those who enter the first elementary grade complete the seven grades. It is probable that one of the chief causes for the average pupil leaving school before completing the elementary grades is the difficulty or uninteresting character of the work required. The public elementary school system in North Carolina seems to be "pitched" or "tuned up" for that small portion of the population which has an interest in and an ability to complete an academic high school course.

Each of the five studies noted above appeared first in the January, 1924, issue of *The High School Journal.*

M. R. TRABUE. Scales for Measuring Judgment of Orchestral Music. *Journal of Educational Psychology,* December, 1923.

This was the report of a research begun several years ago and only recently completed. Two sets of equivalent scales were arranged and standardized for measuring small differences in the abilities of human beings to judge relative quality among orchestral selections played by the phonograph. From the application of these tests to hundreds of pupils in various grades it was found that the usual differences in ability between elementary school pupils and college pupils is much smaller than the differences between those pupils in a sixth grade who have been exposed to good music and those in the same grade who have not. In other words, by means of the scales devised it has been possible to demonstrate the possibility of teaching musical appreciation. Similar studies by the same author had demonstrated relatively little possibility of teaching poetic appreciation.

ADA B. VIELE AND D. H. BRIGGS. Abilities of Wake County High School Pupils in English.

All the pupils in the accredited high schools of Wake County were given standard tests as follows: (1) Power to read and understand English paragraphs; (2) Power to recognize and identify correctly the synonyms of selected English words; (3) Power to write English compositions of good quality; (4) Power to punctuate properly an English sentence.

The average Wake County high school senior is as much better in English than the average freshman as the seniors elsewhere are superior to freshman elsewhere. In other words, progress in English is apparently as great in Wake County as in high schools elsewhere. The average senior in Wake County, however, does not do as well in some of the tests as the average freshmen in high schools of other states. Pupils in the Wake County high schools seem to make satisfactory progress, but they begin this progress at too low a point.

There is as great a difference between the freshmen in the best Wake County high school and the freshmen in the poorest Wake County high school as there is between the average senior and the average freshman. In several schools the sophomores and juniors had lower average scores than the freshmen, because pupils from small rural schools, offering only one or two years of high school work, were brought in to take their last two or three years in an accredited high school. Throughout the study it was apparent that the weaknesses of Wake County high school pupils in English are largely due to defects in their preparation in the elementary schools.

M. R. TRABUE. A Graphic Chart for Representing Educational Achievement Test Scores. *Journal of Educational Research.* May, 1924.

This article reports a device for representing graphically the measured facts regarding pupils' achievements. The device makes it possible for parents and pupils to understand the meanings of the scores obtained from educational measurements and at the same time relieves supervisors and specialists from the necessity of spending long hours in preparing interpretations for their teachers. The translation of numerical statements into graphic pictures which can be grasped easily by the mind of anyone interested in educational achievements is a long step forward in the development of a practical science of instruction.

The following studies are well under way and will be ready for publication during the next few months:

Ada B. Viele: A Test for Measuring Ability to Judge the Quality of English Prose.

W. O. Hampton: A survey of Educational Conditions and Needs at Sylva, N. C.

R. F. Marshburn: Abilities of Warren County High School Pupils in English.

M. R. Trabue: A County-Wide Plan for School Administration and Support in Person County, N. C.

Estelle Rawl: The Most Adequate Basis for Classifying First-Grade Pupils in a Mill Village School.

Ada B. Viele: A Summary of the Achievements in English of High School Pupils in North Carolina.

F. G. Morgan: An Effective Basis for Classifying Freshmen in Lenoir College.

The Bureau is also co-operating with some of the departments in the College of Liberal Arts in studies of the classification of their students in order to achieve the best results from instruction.

A. M. JORDAN has carried on the following studies during 1923-1924:

Test Validation. *Journal of Educational Psychology.* September and October, 1923.

The purpose of this investigation was to determine the best one of four tests of "intelligence" or mental alertness. The tests used were the Miller,

Otis, Terman, and Army Alpha. The criteria employed were: (1) Binet-Simon test of intelligence, Stanford Revision, (2) the average of four estimates of intelligence, (3) age, (4) a composite of all the group tests, (5) a learning test devised by the writer, and (6) school marks. Correlations were made not only between the group tests as a whole and the various criteria but also between the individual elements (31 in all) of these four tests and the criteria. It was found that the Otis test ranked above the others on the average. Additional light was thrown upon the value of these tests by making use of them in dividing pupils into thirds and then calculating from the first third in one test the number of pupils who would be in the first third when calculations were made by the other tests. There was in general 20 to 35 percent displacement when all tertitles were tested in this manner.

In the second division of this article a table of frequency was made which contained all the discoverable coefficients of correlation computed with that individual test in order that one might determine whether in any given case a coefficient of correlation was either higher or lower than those found by other investigators. A selected bibliography of 62 titles bearing on the topic is appended.

Test or Tests in Prognosis. Accepted but not yet published in the *Journal of Educational Research.*

By means of a statistical device known as multiple correlation the optimum correlation between one test, two tests, three tests, or four tests and the criterion chosen was computed. It was discovered, contrary to ordinary opinion, that two tests were hardly any better than one and three or four no better than two.

Children's Preferences in Reading. Published in the *High School Journal.*

This is a report of a rather extensive investigation of children's interests in reading. The procedure was divided into two parts, (1) a questionnaire which 3598 children, distributed rather widely geographically, were asked to answer. What books do you like best? was the prevailing type of question. (2) Investigation in libraries in which the writer observed for three months what children choose when their choices are free. The children observed were those reading in the children's rooms of public libraries in and around New York City. The differences at the various ages were found to be large for both boys and and girls, there being a rapid increase in interest in adult fiction for both boys and girls during the period studied. Probably the most clear cut findings were the large differences in interest found between boys and girls. Boys much prefer books dealing with war, scouting, athletic contests, and other strenuous adventure; while girls have a preponderating interest in books of fiction whether juvenile or adult.

Abstracts of theses presented to the Department of Education for the degree of Master of Arts and Master of Science in June, 1924, follow.

D. H. BRIGGS. The Influence of Reconstruction on Education in Tennessee.

The purpose of this study was to determine as nearly as possible the influence of reconstruction on education in Tennessee. In order to evaluate justly this influence it was necessary to show the status of the schools before 1860, to trace the development of education during the days of reconstruction, to follow the progress of the schools after the close of radical rule, and to study the political and economic history of the State both during and after reconstruction. Conclusions were drawn only after a careful study of all the original and secondary sources available.

The results of the study show that by attempting too advanced a system of education for the prevailing conditions of the State more harm than good was done. A sentiment was developed against paying taxes for schools which has not since been completely overcome. Sectional jealousies also arose which have been a hindrance to the educational advancement of the State. The reconstruction regime cost almost $30,000,000, a large part of which was spent extravagantly. This became a State indebtedness which worried the people for almost a half century before it was finally settled. The tax-rate to pay the interest and liquidate the debt was so high that it was almost impossible to raise sufficient funds for school purposes.

Contrary to certain prevailing opinions reconstruction had a very detrimental effect upon public education in Tennessee.

C. R. HINSHAW. Public Education in Bertie County.

This study is an attempt to show in a historical and statistical way the development of public education in Bertie County, North Carolina, from the beginning of public schools in 1841 to the present time and finally to lay out in detail a plan of county-wide consolidation.

Bertie County was created by the General Assembly, at Edenton, in October, 1722, and has an area of about 700 square miles. Agriculture is the leading industry. In 1920 the population was 23,993, of whom 13,639, or 56.8 per cent, were negroes.

The schools made a creditable beginning before the Civil War. The average salary paid teachers in 1855 to 1860 was more than it was as late as 1900.

The revenue for schools in 1920 was seven and three-tenths times as much as it was in 1900. Thirteen and six-tenths times as much was spent for supervision in 1920 as in 1900. The amount paid white teachers increased nearly tenfold during those decades.

Special legislation particularly affecting the schools of the country is treated somewhat fully. Lastly, a concise plan for the reorganization and consolidation of the schools of the county is given.

## VERA MILLSAPS. Educational Theories and Influence of Archibald D. Murphey.

The purpose of this study was to view the economic, social, and political conditions of Archibald D. Murphey's time and to discover his fitness as a leader, to study his plan for internal improvements, to evaluate his report on public education, to summarize his achievements, and to identify later movements which bear the stamp of his influence.

Educational development in North Carolina was very slow because of the ignorance of the people, low educational ideals, and the indifference of the Legislature. Murphey was the most outstanding leader and advocate of improvements for the uplift and welfare of the state, and he devised a system of internal improvements whereby the state might become economically independent and financially able to support a system of public schools. His report on education (1817) outlined a plan which provided for a regular gradation of schools from the primary schools to the university. This plan provided for all; it expressed the fundamentals of education; acknowledged the sciences of psychology and pedagogy; emphasized the need of trained teachers; and recognized the opportunity of training for citizenship.

Murphey's work in behalf of internal improvements was the beginning of the State Geological Survey and his plan for education served as a model when a public school system was finally adopted. He ably foresaw the needs of the times and drafted plans for their solution remarkably like those which have been carried out by others at a later day.

## WILEY M. PICKENS. The Development of Education in Rowan County.

This study traces the development of education in Rowan County from its formation in 1752 to 1923. This development is divided historically into three periods: (1) The period of the academy; (2) The period of the ante-bellum public schools; (3) The period of the public schools from 1865 to 1923.

In the first period of development which extended from 1752 to 1840 the influence of the churches, Episcopal, Lutheran, Presbyterian, and Reformed, is treated and the results of the work are shown through the history of the academies and schools which the religious bodies fostered.

In the second period, which extended from 1840 to the Civil War, the rise of the public schools in Rowan is treated.

The third period covers the development of the schools from the Civil War to the present time. The organization of the special chartered schools is considered and their growth during this period is shown.

In the concluding chapter some of the more pressing present day problems of education in Rowan are considered and recommendations are made for their solution.

ARTHUR RANES. Some Phases of North Carolina Education Prior to 1860.

In this study no attempt has been made to exhaust the field of education in North Carolina prior to 1860, but the chief purpose has been to treat the more important phases of education in the State during that period, and at the same time to give to the special student, as well as to the general reader, such a story as will enable him to secure an intelligent understanding of the subject.

The first chapter is a treatment of education during the colonial period, and the influence of the restlessness, the shifting and unstable conditions of the times. The second chapter sets forth the agitation for schools and early attempts at school legislation. The third chapter undertakes to point out the weakness of sufficient control, and the serious handicap imposed by a non-centralized authority. The curriculum, the schoolhouses and other physical equipment, methods of teaching, of support and of control, and the growth of a conscious need for professionally trained teachers are among the topics treated.

L. R. SIDES. Examinations and Promotions in the Accredited Secondary Schools of North Carolina.

This study deals with the conduct of examinations and the administration of promotions in the Secondary Schools of North Carolina. The data were obtained by means of a questionnaire sent out in the fall of 1923 to the principals of all the accredited secondary schools in the State. Returns were made by 210 of the 320 schools then accredited, so distributed that every geographical section of the state and every type of accredited school was well represented. The findings, therefore, are far more accurate than would be the result obtained from a random sampling.

In this study the following are some of the more important questions considered: the frequency with which final examinations are given, the emphasis placed upon examinations, types of examinations used, the care with which examinations are prepared, by whom prepared, the purposes for which examinations are given, the extent to which oral examinations and standard educational tests are used as a basis of promotion, how promotions are administered, the flexibility of promotion schemes, and the relation which examinations and promotions bear to the retardation, elimination, and educational progress of pupils. Finally, constructive suggestions are offered as to how these important phases of school procedure may be improved.

In the proposals made in this thesis for the improvement of examinations and promotions the position is taken (1) that examinations should be

so administered as to promote the best educational progress of the pupil, rather than merely to determine whether he should be promoted; (2) that the primary purpose of examinations should be to enable him to reorganize the materials in that field with a view to making them a permanent mental possession and to reconstruct his own thinking or thought-life; (3) that standard educational tests should supplement examinations of the traditional type to a larger extent than at present; (4) that final examinations should be required of all pupils regardless of their class standing; (5) that a more flexible scheme of promotion than that found in most North Carolina high schools at the present time is highly desirable to achieve the best educational progress for the pupil.

EDWARD O. SMITHDEAL. The Development of Education in Warren County.

This study traces the development of education in Warren County, through the academy movement and the ante-bellum public school movement to the present time, points out both the weaknesses and strong features of the present system, and offers suggestions for a constructive program of social work.

The social, economic, geographical, and political factors influencing the county are treated with the historical records, newspapers, and public documents as the chief sources of information. Others were the biennial reports of the state superintendent, the report and annual statement of the county superintendent, and material received through correspondence and questionnaires.

In comparison with other typical counties similarly situated Warren County is above the average in many important respects. But there are some needed changes and adjustments that would make for greater efficiency and economy of school work. The more important suggestions are:

1. A thoroughgoing survey of the schools.
2. Adoption of county-wide unit basis.
3. The establishment of a central county high school in or near Warrenton.
4. The consolidation of districts to form larger units of school work, and the organization of a number of junior high schools at strategic points.
5. The establishment of an additional vocational-agriculture school for negroes.
6. A uniform 8-months' term for all country schools and nine-months' term for standard high schools.
7. A rural school supervisor.
8. A full-time county welfare officer.
9. A superintendent of motor trucks and transportation.
10. Additional scientific apparatus and office equipment.
11. Organization of extension classes.
12. The erection of homes for teachers.
13. A closer identification of schools and rural life.

## R. W. WHITENER. The Growth and Development of Education in Catawba County.

This study traces the growth and development of education in Catawba County. It contains a historical sketch, and a map of the county showing the principal geographic features, the present school districts, and a plan for consolidation. Four distinct periods appear in the development of the schools of this county: the period before 1860, the period from 1860 to 1900, the period of expansion after 1900, and the present period which is marked by the movement for consolidation of schools.

Education in Catawba County began with the parochial schools, about 1760, a few years after the settlement of the county by German immigrants from Pennsylvania. In 1854 the county adopted the State system of schools provided for in the Act of 1839 and developed a very creditable plan of public education by 1860. The period from 1860 to 1900 is marked by slow growth on account of the unsettled economic and political conditions. The elimination of racial conflict by the constitution took place during the closing years of the recent century. The increase in economic prosperity, and other foundations for reform gave rise to expansion of the schools between 1900 and 1920. The fight was no longer for the principle of public education but for more adequate school support, better physical equipment, better trained teachers, longer terms, and other improvements. The era of consolidation began in Catawba County in 1900 and is rapidly removing the small and ineffective schools and developing larger types of public school organizations. The most pressing needs of the county now are:

1. A complete county-wide survey to determine the permanent location of the proposed consolidated school.
2. The county-unit plan of school support and school organization.
3. A longer term of office for the county superintendent of schools.
4. Increased facilities for the training of prospective teachers and teachers in service.
5. The improvement of facilities for the education of the negroes.

## T. A. WHITENER. Guidance of College Freshmen, A Study of Some Special Factors.

The fact that college students have need of vocational information and guidance is indicated in the first part of this thesis by three sets of data: (1) tables showing that in North Carolina there are relatively few men in certain of the important professions; (2) tables showing that a large proportion of the members of the freshman class in the University are undecided as to a vocation; (3) tables showing that the vocational choices of the seniors are distributed in an entirely different manner from that found among the freshmen.

The efforts of the University of North Carolina to supply students with vocational and educational guidance include: (1) the Special Library Shelf, which furnishes vocational information; (2) vocational counselors

for all professions represented by the faculty; (3) vocational information tabulated by the different departments of the University; and (4) information obtained by psychological testing.

The second part of this thesis is a special study of some of the factors that may be used to predict the academic success of college freshmen and therefore the value of these factors as bases for educational guidance in college. The influence of various social distinctions on scholarship marks is the first study in this connection. The four bases of social classification studies were:

Vocational choices of the freshmen.
Occupations of the fathers.
Education of the parents.
Church affiliation of the freshmen.

These factors influence scholarship marks in many instances.

The influence of the above-mentioned social classifications on the Otis scores was studied in like manner. Ability, as measured by the Otis Intelligence Scale, varies somewhat with the different social groups.

The relationships between the Otis scores and scholarship marks in college were studied at some length. The Otis scores were correlated with the final grades in each of nine of the most popular freshman courses. Correlations were also made between the Otis scores and the general average of marks in scholarship; between the Otis scores and average scholarship marks when age is held constant; between Otis scores and age; and between scholarship marks and age.

The choice of a classifying test is considered in the last part of the discussion. Evidence is presented which suggests a relatively low predictive value for the Otis Test as compared with other tests. It seems probable that a test or series of tests might be devised which would meet the needs of our local situation more adequately than any of the commercially available tests.

In conclusion, the importance of continued studies in the field of Educational and Vocational Guidance is emphasized. The correlations between various tests and actual success in college must be studied for a period of at least four years before conclusive results can be obtained.

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## DEPARTMENT OF ENGLISH

EDWIN GREENLAW has completed the organization of editorial work of the new Variorum Spenser, and has arranged for its publication. He is actively engaged in the preparation of the first volume of this edition. An article entitled "Recent Studies in the History of Thought" appeared in *Studies in Philology,* October, 1923 (XX, 496-504).

NORMAN FOERSTER read before the Philological Club in April, 1924, a paper on "Emerson's Conception of Organic Art," showing how the idea of the organic, revived by romanticism, became of central importance in Emerson's criticism of literature and the other arts. This paper is part of a chapter on Emerson to be included in a book on which Mr. Foerster is at present working: *Literary Criticism in America.*

THORNTON S. GRAVES has published during the year:

Strolling Players in the Eighteenth Century. *Notes and Queries,* 13 Series, Vol. I.

Notes supplementing the knowledge of itinerant players recently contributed in articles by Captain Elbridge Colby and Professor Alwin Thaler.

Some Pre-Mohock Clansmen. *Studies in Philology,* October, 1923.

A discussion of the nature and activities of such secret organizations in the sixteenth and seventeenth centuries as the "Damned Crew," the "Tityretues," the "Bugles" and the "Hectors."

Some Chaucer Allusions (1561-1700). *Studies in Philology,* October, 1923.

A supplement to Miss Spurgeon's *Five Hundred Years of Chaucer Criticism and Allusion.*

On the Reputation of John Heywood. *Modern Philology.* November, 1923.

Material not utilized in Professor Bolwell's recent study of Heywood—further evidence of Heywood's popularity and influence during the 16th and 17th centuries.

Recent Literature of the English Renaissance. *Studies in Philology,* April, 1924.

A classified bibliography of the more important productions of 1923 dealing with the English Renaissance. Some of the more important books are reviewed, and various articles which seem to call for annotation are accompanied by brief notes.

Ralph Crane and the King's Players. *Studies in Philology,* April, 1924.

The reprinting, with comments and suggestions, of most of Crane's extremely rare autobiogoraphical poem showing that he probably served for a time as playhouse copyist for the famous theatrical company of which Shakspere was a member.

The Literal Acceptance of Stage Illusion. *South Atlantic Quarterly,* April, 1924.

Representative anecdotes illustrating the literal acceptance of acting are examined with the object of determining the extent of their reliability.

A Neglected Side of Dramatic Criticism. *Texas Review,* April, 1924.

A brief consideration of the interesting but extremely unreliable evidence indicating the frequency among early audiences of extemporal criticism of acting and dramatic technique.

The Adventures of Hamlet's Ghost. Read before the Philological Club in October, 1923, and to be published in the January (1925) number of the *Philological Quarterly.*

A brief stage history of the Ghost, together with comments on certain tendencies in Shaksperian criticism.

W. F. Thrall has completed his study of the historical setting of *Imram Snedgusa ocus Mic Riagla,* "The Voyage of Snedgus and Mic Riagla," a religious legend belonging to the group of early Irish voyage tales known as *imrama.* The results of this study have been embodied in a doctoral dissertation, an abstract of which will appear in a bulletin to be issued by the University of Chicago in November. A section of the study will appear in a more expanded form in *Studies in Philology.*

C. A. Hibbard has been engaged in research on the subject of "Undergraduate Publications and their Relation to the Development of American Literature," three studies of which have already appeared.

The following theses for the degree of Master of Arts were approved by the Department in 1924:

James Milton Ariail. Some Immediate English Influences Upon *The Faerie Queene,*—Book One.

The first ten cantos of Book I are taken to be under the predominant influence of the Morality play. Analogues of typical Morality plays are submitted and it is shown that these cantos form a composite of the double-plot conflict type Morality, and stage one of the Coming of Death plot as it appears in *Everyman.* A minute study of the House of Holiness and the House of Shrift in *Everyman* is submitted as evidence of the influence of

the latter. Spenser's Catholic bias is argued and the question of his religious Puritanism is discussed. In these cantos the romance element is taken as the structure for Christian allegory.

Canto xi, Book I, lies outside of the Morality scheme and influence. This canto is treated as a complex of medieval forms fused into a great spiritual conception. The three days' fight at the castle is a combination of Biblical and mystery play elements; of folk-drama and the English metrical romances. Isolated events in Book I are left for later treatment and the study of the ten cantos as a Morality is related to other well known interpretations of *F. Q.* Book I.

KANSAS BYERS. The Arthurian Legend in American Literature.

The purpose of this thesis is to indicate something of the amount of American literature on the Arthurian legends; to make a comparative study of selected American themes with similar themes in Malory, Tennyson, Morris, and Swinburne; to study briefly the modes of treatment found in the American literature; and to review the material chronologically.

Upwards of one hundred American authors have given some attention to the legends, about thirty of whom are comparatively well known in America. The literature itself is varied in type, including short lyrics, short and long narrative poems, novels, historic treatments and drama. The comparative study is the main part of the thesis and is intended to show the development of the legends in America and the American attitude toward them. The summary of modes of treatment is self-explanatory. The chronological review suggests reasons for the amount and tone of the legendary literature at different periods.

MACK CUTCHIN GORHAM. *Jean Christophe* and the English Genius Novel.

This work of Rolland's has been taken as starting point, not because all the genius fiction herein considered shows either direct or indirect influence of this work, but because they are all manifestations of the same great current. It had its beginning with Tolstoy, or rather he is the earliest of its modern champions. The movement of genius literature gained new zest in the twentieth century with Rolland and since the publication of his work in 1914 many modifications have appeared. To consider these in England and America is the effort of this thesis.

CHARLES FREDERICK HARD. Studies in Deloney's Prose.

In this essay four topics are discussed: (1) The purpose and general plan of Deloney's novels; (2) sources and influences affecting Deloney's works; (3) Deloney's contribution to prose fiction; (4) Deloney's social ideals.

Section I deals with Deloney as a professional pamphleteer and calls attention to his consistent intention of celebrating the craftsman, tracing

his rise from low estate to a position of wealth and prominence. In this connection, the status of the Elizabethan artisan is discussed, and some attention is given to the audience for which Deloney wrote. Deloney's literary method was to take several stories, partly historical, partly legendary, and partly imaginary, fitting them into a common framework, connecting them by a main thread, and weaving into this material his own observations of the hearty life that went on about him. This scheme is regularly followed in each of the novels.

The conglomerate nature of Deloney's stories, which contain a mixture of popular tradition based on material from the old chivalric romances, current tales similar to those of the jest book, and episodes of contemporary interest, makes it difficult to determine the precise origins of his work. He owes little to the sources which gave Lyly, Sidney, Greene, and Lodge material for their romances. Appealing to a more humble audience, he was but remotely concerned with aristocratic tastes. Yet he shows certain resemblances to the above writers. A number of these resemblances have been pointed out. There is a more obvious relationship between Deloney and the drama, as well as the bulk of literature of a purely popular order. In source material, character treatment, and narrative method Deloney's stories reveal a kinship with contemporary plays. The need for deeper research into this phase of Deloney's work is suggested in the present paper. The connection between Deloney's stories and the informal, spontaneous literature of the masses is even more marked. They have much in common with popular tales and merry jests, both in character and method, but there is little of the rogue or vagabond element in Deloney's work.

Deloney's contribution to prose fiction consists primarily in his full-blooded picture of the happy side of Elizabethan bourgeois life. In the third section of this paper his familiarity with the activities of the burgher class is treated in detail. The study of his technique is continued, with especial reference to character portrayal and humor. A certain interest attaches to Deloney, moreover, as one of the earliest writers to enter the field of historical fiction.

The final section deals with the social ideals of the middle-class Elizabethan, as reflected in Deloney's representations. His notions of a happy society were based, not upon a "rights of man" concept, but rather upon the doctrine of degree,—that each man should do his best in his own condition. Deloney shows a marked interest in the self-made, energetic business man and good citizen. He held no intellectual theory of state, and expounded no doctrines, either political or theological. He simply sets forth the conventional virtues of diligence, pride in one's work, fair dealing, patriotism, and charity to one's fellows. These practical qualities, according to Deloney, insure success, and success is the subject which interests him most.

RENA CHAMBERS HARRELL. Mediaeval Echoes in Hawthorne.

Chapter one deals with Hawthorne's use of allegory as being, like that of the Middle Ages, a conscious and sustained effort to invest narration with a more general or spiritual meaning. The idea of life as a pilgrimage and the idea that a sense of fellowship with mankind is necessary to happiness—ideas which dominated mediaeval thought—are set forth by Hawthorne in allegorical form.

Chapter two establishes the fact that certain incidents in the *Twice Told Tales* and the *Mosses* are reappearances of the *exempla,* these tales being divided as were the old exemplar tales into two parts, the "dilectione" followed by the "betokening," or "significatione." Note is made of the fact that while the themes of Hawthorne's tales are dissimilar to those of mediaeval exempla, yet the purpose is the same: "to prove the forsayde techynge of prudencia trouthe."

The last chapter discusses briefly mediaeval magic as it conforms to "code of rule," explains the mechanism and use of mediaeval magic mirrors, and the magic circle. This exposition is followed by a study of Hawthorne's use of magic mirrors and the magic circle.

The conclusion gives a considerable number of miscellaneous citations from Hawthorne's work, which are single outstanding reminders of the Middle Ages and which strengthen the affirmation that much of Hawthorne's writing has in it a thread of mediaeval coloring.

ABNER WELLINGTON KELLEY. Walt Whitman's Knowledge and Use of the Art of Music.

Walt Whitman heard a great deal of music that was of high order prior to the inception of his *Leaves of Grass.* According to his own statement, the opera was one of the influences that caused him to break from the "ballad style" of poetry. This thesis is a consideration of the plausibility of his statement. The introduction sketches the status of music in America before 1850, the time when Whitman was regularly attending the opera and concert. The second chapter concerns itself with Whitman's contact with the art of music. A discussion of what types of music he heard, of where he heard these types, and of his own testing of his theories on voice production is included in this chapter.

The third chapter deals with Whitman's technical knowledge of music. Topics taken up here include: his knowledge of the terminology and instruments of music; his study of foreign instruments and music; his attendance at the opera; his attitude toward the music of America; his plan for the making her a musical nation.

The fourth chapter deals with Whitman's philosophy of music. The topics studied in this section include: the theory that all nature is musical; the relation of music to poetry and to the other arts; the relation of Whit-

man's theories to the theories held by members of the Romantic School in Germany; the relation of his theories to those of the American Transcendentalists.

The fifth and last chapter is a discussion of the significance of Whitman's knowledge of music and the suggestion of the probable effect of this knowledge upon his poetry. The conclusion is reached that music was a great influence upon the poet, perhaps being the one which caused him to break away from rime and metre.

THOMAS A. LITTLE. Bunyan's Indebtedness to His Time.

The first chapter is concerned with Bunyan's conscious literary ideals. These ideals—unswerving moral didacticism, subordination of artistry, adaptation of allegory and fancy, and directness and simplicity—were the joint product of the Puritan religion and seventeenth century thought. They are important because they were constant and because they determined the particular field of writing where Bunyan spent his energy and where we know him.

The second chapter is a discussion of Bunyan's literary and intellectual attachments, in which the possible, probable, and certain influences are catalogued and Bunyan's relationship to them established. Contrary to popular emphasis, Bunyan read and was acquainted with a considerable field of literature. In his controversial tracts and the general statements in his other works he displayed familiarity with a large number of the various sorts of seventeenth century productions. The allegorizing ferment so prevalent in Bunyan's time is traceable to earlier times, and examples of religious allegory are available to us now and have always formed a considerable bulk of theological literature. Specifically there is a long list of antecedents and analogues of Bunyan's great allegories. His debt to these was indirect only, as they merely preserved and enhanced the traditional custom of allegorizing almost everything. With some of these Bunyan was doubtless familiar, but he did not plagiarize. He was well enough acquainted with the literature of his time to know that certain devices, schemes, and plots were common property. All of his works were definite types of literature common to the seventeenth century. Bunyan unhesitatingly appropriated these devices, giving each one the stamp of his genius. The probable sources of Bunyan's works are either indirect or unconscious. They are probable sources on account of their availability to Bunyan, their large participation in the thought movement of his works, and the restricted field of incident or verbal similarity. In addition to these probable sources we can definitely trace intellectual attachments of no mean consequence as Bunyan's fame as a prisoner, preacher, and author, increasingly brought him intimately into contact with particular men of education and culture. Finally, in Bunyan's works there are specific allusions to a limited list of popular works. The allusions are significant and must not in any sense be

understood to limit the field of Bunyan's literary acquaintance because these works are no more definitely reflected than are some of those probable sources about which direct testimony is lacking.

## HOWARD MEACHAM REAVES. The Origin of Francis Bacon's Theories of the Method and the Purpose of Science.

This essay seeks to explain the anomaly of the position of Francis Bacon as a scientist. He had severely criticized the scientific methods used in his time. He was indifferent to the discoveries made by his contemporaries. He himself made no great contributions to science in the form of inventions or discoveries. Yet he suggested a method of science which has since then proved immensely successful in the hands of other scientists. The problem was to explain why Bacon himself never produced inventions of any consequence.

It was shown that Bacon's attack on scientific methods was really directed against the schoolmen of his own time, and not, as is usually supposed, against the ancients. A study of Bacon's statement of the method and purpose of science and a comparison of these with the methods and purposes of ancient writers revealed the fact that Bacon was indebted to Aristotle for much that he included in his statement of the method of science and to Seneca and Lucretius for much that he included in his statement of the purpose of science. Bacon made an important contribution to the idea of progress by stating the purpose of science as utility, and he more nearly approximated a complete statement of this idea than anyone before him had ever done.

Thus it appeared that the source of Bacon's inspiration along scientific lines was literary and classical. Bacon was primarily a scholar, not a scientist. His research was carried on in the mind of antiquity, not in a scientific laboratory. But because of his official position and immense philosophical and literary ability, Bacon was able to draw universal attention to the methods and purposes of science and thus rendered a service of tremendous importance.

## CHESTER MCKINLEY SUTTON. Milton's Attitude Toward Educational Theories of the Seventeenth Century.

Samuel Hartlib was one of the most active educational reformers of the seventeenth century. He did not write much on education, but he published works on the subject by Comenius, Milton, and Petty. Comenius and Petty, along with Hartlib, advocated universal education; they would exclude none on account of poverty or social position. They planned for the education of children and also for the education of women. Milton differed in all these respects. His plan was for the education of the sons of noblemen, and only those who were at least twelve years old. He had nothing to do with the education of children or women.

There was also great interest in scientific research in this century. Various philosophical colleges were proposed for the advancement of this branch of learning, and the Royal Society actually engaged in it with much enthusiasm. Milton could not enter into this because he considered it against the will of God to attempt to fathom the mysteries of nature. He believed in "knowledge within bounds." In *Paradise Lost* he protested against the practices of what he considered the idle curiosity of man. His theory was that man should study only those things which are of use in daily life.

## S. H. WILLIS. The Treatment of Nature in Hawthorne.

In order to determine Hawthorne's fundamental conception of nature and to throw light upon the importance of its use in his works, a study of nature as an element in his private life as well as in his published works was made. He chose all his homes in attractive spots surrounded by nature, and consciously and consistently sought nature's retreats for recreation, solitude, freedom from the world and its affairs, a place to think and compose his literary work.

These uses of nature are reflected to a marked degree in his works. The following facts regarding his use of nature were found: (1) He manifested little scientific interest in or knowledge of nature. (2) He used nature extensively as a setting for action, crises arising and being solved in nature settings almost exclusively. (3) He created definite atmospheres for particular situations by the use of nature. (4) He used nature as symbols, similes, metaphors, and analogies to things in human affairs. (5) He used nature to further characterization and character development. (6) He used nature outlines rather than descriptions, because his theory of art was that the beauties of nature cannot be transmitted by pen or paint and that the artist can only suggest the truth. (7) He conceived of nature's objects as coöperating with each other and with man, nature being a spiritual, purposeful, intelligent personality. (8) Yet he apparently had no well-defined philosophy of nature.

## KATHARINE ELIZABETH WILSON. Satire in Poe's Works.

The purpose of this thesis was to discover the extent and quality of the satire which exists in the writings of Poe. It was found after a careful examination of the Virginia edition, that the chief objects of Poe's satire are literary movements, such as transcendentalism and magazine literature. Some of the bitterest satire, however, is directed against society.

The satire, for the most part, is too direct and personal to be ranked with that of the great satirists. It is, moreover, completely overshadowed by Poe's more important contributions to literature. In spite of these deficiencies, the satirical writings of Poe are important because they reveal an aspect of Poe's character which is often overlooked, and because they are of historical importance in the study of American satire.

LOUIS BOOKER WRIGHT. Vaudeville Elements in English Drama Before Shakespeare.

This paper is a consideration of the types and extent of the vaudeville, or variety show entertainment, employed in English drama before Shakespeare's first work, 1592, and is preliminary to a similar study of the Elizabethan drama to the closing of the theatres, 1642.

The drama from the beginnings has been studied and proof is offered of the presence of vaudeville elements in the religious drama, in the early moralities, in the later interludes and in the fully developed drama. It is shown that this extraneous variety entertainment was inserted at the demand of popular taste; that dull plays were enlivened by extraneous comic or spectacular matter; that there was no general sense of impropriety in the insertion of this matter even in serious plays; that early dramatists took advantage of situations arising in the action of a play to insert vaudeville scenes, such as turning a stage fight into a fencing match.

Examples of the use of comic dancing, comic song, detached clownery, juggling and legerdemain, tumbling and feats of activity, the use of trained animals, etc., have been collected from the drama before 1592 and the extraneous nature of this material has been pointed out. References in contemporary literature and records of the players on the Continent, in the provinces, at Court and in the London theatres have been cited to show that the early actors combined the skill of variety show entertainers with their regular dramatic repertoire. The discussion has attempted to show that the employment of variety show material in the drama was a widespread practice in the early history of the stage.

The following doctoral dissertations were approved by the Department in 1924:

IRENE DILLARD. A History of Literature in South Carolina.

The literature of South Carolina, representing as it does the expression of the most peculiarly provincial life of the original American colonies, is a unique part of American literature. Separated from the earlier colonies by political traditions as much as by distance and difference of trade routes to Europe, Carolina became the nucleus of the feudal system of plantation which culminated on the one hand in the elaborate society of ante-bellum Charleston and on the other in the Confederacy and war. A study of the history of South Carolina answers the question of the State's failure to live up to its early promise by revealing the fact that the whole trend of Carolina history up to the Twentieth Century was a gradual death of English traditions of the English Restoration Period rather than a steady growth of what we call Americanism.

Carolina was born of the Restoration. The colony was the gift of Charles II to eight of his court favorites. Its constitution was the Utopian scheme of John Locke. Its colonists were men who would be lords or

wealthy merchants. For half a century from 1680 to 1730, Charles Town on the Ashley struggled to realize the dreams of Locke and the Lords Proprietors. It succeeded at least in establishing precedents that held through subsequent half-centuries. It traded directly with England via the West Indies; it educated its sons at the English bar; it was separated from and indifferent to the interests of the American colonies toward the north. Its literature during this first half-century shows a notable lack of the amazement and wonder of the first literature of the older colonies; but follows rather the sophisticated writing of the philosopher and parliamentarian.

The fifty years preceding the Revolution saw the development of a luxurious Carolina plantation life, centering in the brilliant cultural society of Charles Town. The Gazette, the Georgia colony, and its consequent battle of wits over Methodism, the theatres, literary, philosophical and antiquarian societies, the famous St. Cecelia Society came in rapid succession, with never a grievance of any consequence against the mother country. Scholars came in great numbers from England, particularly ministers and scientists, while native sons gave vent on public occasions and through the press to the oratory and leisurely essays they had learned to love from their prototypes in English life. Poetry, the drama and art were followed by practice or patronage as matters of course. The Revolution itself, undertaken with reluctance, or in the spirit of sportsmanship as the case might be, was by no means a premeditated plan for independence from England on the part of Carolina.

With the coming of American independence, however, Carolina was placed in the anomalous position which John C. Calhoun gave his life at Washington to interpret, and South Carolina withdrew from the Union to defend. From the final separation with England in 1814 to the separation with America in 1860, South Carolina struggled to establish the States' Rights doctrine of independence, and the literature, consequently, is preponderantly political. What had promised at the close of the Eighteenth Century to be a fruitful relationship with the English Romantic movement was paralyzed by the intensity of internal political controversy; and the scholarly gentlemen who might have written beautifully of things eternal, spoke fervently of things temporal. Volumes of their orations are perserved, and had the cause of the Confederacy been won, would undoubtedly be regarded as worthy. Imaginative literature suffered so much at the hands of the parliamentarians that only William Gilmore Simms, Paul Hamilton Hayne and Henry Timrod succeeded in making reputations for themselves beyond the borders of the State.

The war completed the wreckage of South Carolina society. From 1865 to 1895 the State was steadily being reconstructed. The war with Spain brought it to its real American feet, so to speak, for the first time. Literature during the Reconstruction was nothing but lamentation and history,—and very little of that. With the Twentieth Century and material prosperity came a revival of heart and interest in literature, so much so that the Charleston group of poets, the Columbia Stage Society, and the Folk-Lore Society of South Carolina are attracting nation-wide attention.

ALMONTE CHARLES HOWELL. Sir Thomas Browne and Seventeenth Century Thought.

Sir Thomas Browne's reputation for learning was remarkable in his own day and has continued to be respected by his editors and biographers. But it has never been studied systematically. This dissertation attempts to analyze and classify Browne's references to other writers, and to discover how he used his vast reading in the course of his works. The final chapter endeavors to link Browne more closely with the great scientific movements of his century and to show that his scientific method was sound. Thus, the whole dissertation is an effort to show how Browne's intellectual life was typical of the seventeenth century.

In an introductory chapter, Browne's reputation for learning among his contemporaries is considered; and an effort is made to show the variety of his learning. His knowledge of the sciences, of the arts, and especially of the languages is taken up in some detail.

The succeeding chapters deal in minute detail with his references to the writers of Greek and Roman antiquity, the Bible, the Fathers, the Byzantines and Medieval writers, and the writers of the Renaissance.

Browne's references to the Greeks are very numerous. In this chapter as in the others which follow, the writers were classified as poets, historians, philosophers, scientists, and a miscellaneous group consisting of orators, romancers, satirists and others. Within the group they were discussed chronologically.

From the poets, and especially Homer, Browne took many references, chiefly ornamental. He used the historians, especially Herodotus and of course Plutarch, to confirm his views, to settle disputed points, or to point out errors. His use of the philosophers is usually for the purpose of showing his learning. He was familiar with all the principal schools of Greek thought and refers frequently to Plato. Browne's greatest debt to Greek writers is to the scientists. Hippocrates, Aristotle, Strabo, Ptolemy, all the major writers are referred to time and again in his works. The greatest number of his references is to Aristotle, whom he frequently confutes. His use of the scientists is generally to point out the errors for which they are responsible. He has great respect for Hippocrates. This chapter concludes with brief references to Lucian, and to the Hebrews and Egyptians whose Greek writings find a small place in Browne's works. He finds the origin of many popular errors in Orus Apollo, and relies upon Josephus for historical facts about the Hebrews.

In general, Browne's references to Roman writers are much like his references to the Greeks. He seems to be most fond of Latin poetry, and quotes or refers to every major poet from Ennius to Claudian. However, he seldom essays any critical remarks on the poets. His references are largely decorative. He also makes frequent use of the Latin historians as authorities and as the source of interesting anecdotes and allusions. But it is Pliny, the great collector of lore on natural science, that Browne uses most

of all the Romans. In his work Browne finds many errors which he is able to confute. His opinion of Pliny as a collector is high, but as a scientific investigator, Browne had little use for him. To a miscellaneous group of philosophers, scholars, rhapsodists and romancers, Browne makes occasional references, showing his familiarity with them. Hardly a major writer has escaped his omniverous appetite for reading, and his use of these references is critical, studied and accurate.

Examination showed that Browne was familiar with all of the main writers among the Church Fathers, the Biblical commentators and translators and the historians of the early church, both Greek and Latin. He found their writings a fertile source of errors in natural history, and felt no compunction at exposing them. It is hardly necessary to dwell on Browne's knowledge of the Bible. He was a recognized authority in it. He was even willing to admit allegorical instead of literal interpretation at times. He seemed to have been equally at home with the commentators, from the earliest times on down to his own generation.

From Byzantine Literature, Browne drew little, though he quotes a number of the writers of the Eastern empire. His references are usually for the purpose of confuting errors in science or history, of adding to his list of authorities or of ornamenting his work with learned allusions. The historians and chronologers furnish the most of the Byzantine references.

Browne makes a more or less extensive use of the Latin literature of Medieval Europe, especially history and religious work. He finds in Albertus Magnus and other speculum writers many of his typical vulgar errors. From the historians he obtains much information in regard to the historical errors common among his contemporaries. Among these he mentions Matthew of Paris, Bede, and Geoffrey of Monmouth. His reading in this field seems to have been wide and thorough.

It is not difficult to discover why the list of English writers mentioned by Browne does not contain the names of Shakespeare, Milton or Spenser. He was not interested in the things they wrote and so although he may have read them, he found no place in his work for reference to them. However, he knew the English scientists, the historians and the scholars of his own century and the century previous. The names of Bacon, Harvey and Gilbert are prominent in his references to the English writers, and besides these, a host of minor ones appear. In general he used the English references as a modern scholar would do: he used them as authorities, or contradicted them; in a few cases, they served as ornaments to the work.

By far the greatest number of writers mentioned in Browne's works were men living on the continent of Europe, scholars, historians, scientists and men of letters of the Renaissance. He considers many of them as first rate authorities in the fields in which he is interested and does not hesitate to refer to them frequently. A number of these references are of the conventional character but the great majority of them are so definite and exact

that one is confident that Browne had an accurate and thorough knowledge of the works of the writers in question. He was a discriminating reader, and the works which he consulted were authoritative in their day.

In summarizing Browne's use of authorities, it is possible to say that he refers to writers, of all periods and of all literatures, to discover the sources of vulgar errors, to support his own views, to parade his learning, and to ornament his prose in the best seventeenth century manner. He shows critical and historical sense in his use of these references, and seldom relies on authority solely, unless it is legitimate. His attitude is truly sceptical.

It is the purpose of the final chapter to show that Browne was exceedingly learned in the science of his time, that he was really in a position to make contributions to the scientific thought of his age, and that he actually did so. After discussing Browne's debts to Bacon and Descartes for his general ideas as to the method of discovering truth, and showing that, although he wrote in a perfectly orthodox manner, he approached his problems in a thoroughly sceptical frame of mind, the writer endeavors to work out Browne's method of attacking a problem, to reduce it to a formula and to note how he used it in a specific set of his errors. It will be found that he relies upon three weapons to combat error and arrive at truth: Authority, Reason, and Experience or Experiment.

Critics have always maintained that Browne was one of the last great adherents to the Ptolemaic Hypothesis. Bearing in mind his general attitude and his formula for arriving at truth, the writer attempts to show Browne's correct attitude, which is in line with his whole position on scientific matters and may be summed up in one word, open-minded. It was this trait which carried the "Vulgar Errors" through many editions. The book did much to clear the ground of a mass of errors and superstitions making possible the acceptance of the work of the later seventeenth century scientists.

## H. B. MOCK. The Influence of Ovid on Spenser.

It is recognized in the beginning of this study that the problem of the influence of Ovid on Spenser must be treated from two points of view. First, Spenser as a student and reader of Ovid borrows from and imitates him. But in addition to this, he is influenced by an Ovidian tradition from the Middle Ages and of his own day. That is, the very *genres* which he makes most use of, the lyric and romance, the spirit which actuates him, the coloring which he gives his work, his thoughts are largely Ovidian, but Ovidian through a long line of descent. In the first chapter an attempt is made to trace this line of descent.

It is shown that the Court of Love poetry, the love lyrics of Provence and of northern France, owe much to Ovid. Especially did the sentimental stories of the *Heroides* contribute to the love *debats*, to the casuistry of love, made so much of later by the sonneteers. Ovid was known as the "doctor of love," and his psychological study of love had much influence on the medieval courtly romance also. From the example of Chretien de

Troyes it is shown that Ovid helped considerably to shape the French romance of the twelfth century, in which the love element predominates, as it does in the Italian *romanzi* and the *Faerie Queene.* At least the medieval romance is the ancestor of the romantic epic of the Renaissance in many respects.

In respect to philosophical thought the influence of Ovid on the Renaissance is especially significant. By the *intelligenzia* of the time he was looked upon as a profound thinker, the *Metamorphoses* being designed to teach the Pythagorean doctrine of change by "ensample," which method of teaching Spenser follows in the *Faerie Queene.*

The second chapter is concerned with romance in Spenser. By citing allusions, imitations, and borrowings from Ovid it is proved that not only is Spenser following the Ovidian tradition in romancing but he is also using the *Metamorphoses* and *Heroides* as a direct source, especially in his narrating of strange or moving stories of passion.

In the third chapter matters of style are taken up with the purpose of showing that in narration and description Spenser's manner is very similar to Ovid's. His fondness for personifications, his realism, his insistence on a visual effect, the episodic nature of his work, all strongly resemble Ovid's style.

The fourth and fifth chapters deal with Spenser's thought and its mode of expression, especially thought concerning change. Recapitulating what was said in the Introduction regarding the Renaissance methods of inculcating truths and comparing the thought in the episode of the "Garden of Adonis" and the "Trial of Mutabilitie" with certain doctrines thought to have been back of Ovid's mind in writing the *Metamorphoses,* I have concluded that for the most part Spenser is indebted to Ovid for his conception of the principle of change. Moreover, the lack of unity in the *Faerie Queene,* the shifting, changing scenes, the air of instability which everything wears may as well be the effect of the influence of Ovid as due to the fact that the events take place in the Celtic fairyland.

The sixth chapter is taken up with the question of Ovid's influence on the *Amoretti* and other lyrical poetry of Spenser. An attempt is made to differentiate between the elements that are Petrarchan and those that are Ovidian. It is found that eroticism is Ovidian in many cases rather than Petrarchan or Platonic.

## DEPARTMENT OF GEOLOGY

COLLIER COBB has continued the study of microscopic petrography of shore sands and desert sands with relation to their use as a possible source of economic minerals. He has also devoted much of the spring and summer terms to a study of loessal soils from Europe, Asia, and North America, taken from districts already covered by his field work.

W. F. PROUTY published during last year:

Paleontology of Mineral and Grant Counties, West Virginia, in *Geological Report Mineral and Grant Counties,* 1924.

The following studies were completed during the past year by Dr. Prouty.

Revision of the Geological Map of North Carolina. The map is to be published by the North Carolina Geological and Economic Survey.

Geological map and report of Hardy County, West Virginia, to be published by the West Virginia Geological Survey.

Mr. Prouty has the following research work in progress:

Structure and Geological History of the Triassic Rocks of the Deep River Basin, North Carolina.

Geology of the Medina and Older Rocks of Pendleton County, West Virginia.

JOEL H. SWARTZ was engaged during the summer of 1923 in paleontological work for the State Geological Survey of Tennessee. The results of this work and of stratigraphic and economic work carried on during the summers of 1921 and 1922 have been embodied in an extensive report on the *Age, Stratigraphy, and Economic Possibilities of the Chattanooga Black Shale of Tennessee* to be published shortly by the Tennessee Survey. A brief summary of the results of this study was published in January, 1923:

The Age of the Chattanooga Shale of Tennessee. *American Journal of Science,* 4th Series, Vol. VII, January, 1924, pp. 24-30.

The age of the Chattanooga shale has long been one of the most puzzling problems of American Geology. While not regarded as a solution of this problem the present study represents a step in that direction by its correla-

tion of the black shale of the type area and as joining localities in Tennessee with the carefully studied section in Ohio. The following are the chief conclusions reached in this investigation:

1. The Chattanooga shale is overlain in the type area by a thin, gray shale, here named the Glendale shale, equivalent in age to the lower Cuyahoga shale of the Ohio section

2. In the type area and along the Cumberland escarpment the Chattanooga shale is divisible into at least three members: an upper black shale of Sunbury (in places perhaps post-Sunbury age); a lower black shale of Cleveland (and in places perhaps pre-Cleveland age); and a middle gray clay shale of Bedford-Berea age.

3. The upper part of the Chattanooga shale in the Clinch Mountain area is of late Cuyahogan age.

4. The Grainger shale in the type area is entirely Mississippian in age; late Kinderhook to Fern Glen probably.

5. In central and western Tennessee the Chattanooga shale is probably entirely Cleveland in age.

6. The Maury shale is separated from the Chattanooga shale by a marked unconformity, which increases to the west and decreases to the east, probably disappearing before eastern Tennessee is reached. It is to be regarded, therefore, as basal Ridgetop and not as an upper member of the Chattanooga shale.

At present Dr. Swartz is engaged in working out a new method of geologic correlation by which it is hoped to achieve a final solution of the Chattanooga shale problem.

A series of experiments on the transporting power of streams has recently been undertaken by Dr. Swartz. It is hoped by these experiments to determine the factors affecting the amount of material carried in suspension and the laws governing the action of these factors.

During the month of June Dr. Swartz assisted Dr. Prouty in the identification of an extensive collection of paleontological material from Hardy County, West Virginia.

CARL HAMPTON WALKER is engaged in a study of coastal plain topography as determined by the former presence and seaward advance of the shoreline.

WILLIAM BATTLE COBB is investigating the age of soils as determined by the proportion of residual quartz in soils derived from igneous rocks.

CLARENCE E. MILLER has continued investigations in methods of specific gravity determination in rocks and minerals.

The following theses for the degree of Master of Arts in Geology were accepted in 1923-24.

HERMAN J. BRYSON. Stratigraphy of Deep River Coals.

The primary purpose of the paper is to discuss the relationships and the probable geological age of the different rocks in the vicinity of the Deep River Coal Field. This field lies almost in the center of the Red Sandstone belt which is known as the Eastern North Carolina Red Sandstone Area.

There are twelve well-defined Red Sand Stone areas in the Eastern United States extending from Massachusetts to the northern boundary of South Carolina. The irregularity of outline of the areas made it impossible to give the exact aeral extent. The Deep River Coal Field lies in the area known as the Deep River area and extends over parts of Chatham, Lee, and Moore counties, North Carolina.

There are three main types of rocks found in the area: the metamorphics, which include the basement complex of the whole Triassic area; the sedimentaries, which include the lower red sandstone or Pekin formation, the shales and slates of the middle or Cumnock formation, and the upper red sandstone or Sanford formation; the igneous, which include all the intrusions such as dikes, sills, etc.

The origin of the sedimentary rocks was from the sides of the basin. The materials from which they came are the metamorphic slates and the quartz veins that are so numerous in the slates. The materials were deposited under semi-arid climatic conditions.

Many different types of plant and animal remains were found, sometimes well enough preserved to admit of identification. Among those identified are the *Podozamites ramesii,* (new species) *Podozamites carolinensis.* and the *Equesetum columnare* of the plant kingdom. The animal remains were mostly teeth. Teeth of the *Palaesaurus carolinensis* and the *Rutiodon carolinensis* were identified. Several other fossils were found that could not be identified by the writer.

The following conclusions have been reached by the writer concerning the Triassic areas:

1. That the irregularity of outline of the areas is due; (a) to the irregularity of the surface of the underlying sediments on which the sandstone is deposited and (b) to post-Triassic erosion.

2. That some of the Triassic areas of the Eastern United States were never connected (as the Deep River and Dan River Areas) and that some were connected (as certain Virginia Areas).

3. That the underlying slates are of sedimentary origin.

4. That there are three distinct formations that make up the Newark series in the Deep River Area.

5. That the acid dikes are pre-Triassic in age and that the basic are Post-Triassic in age.

6. That the origin of the Triassic sediments is from the slates which are on the sides of the basin.

7. That deposition of the Triassic sediments took place in a series of basins or lakes during semi-arid climatic conditions.

8. That the geologic age is Triassic as is shown by the fossils that are found in the area.

## GERALD R. MACCARTHY. The Laccolith.

"Laccolith" is the name applied to an intrusion of molten rock which has actively up-arched the strata which lie above it, and which has solidified in the chamber thus formed.

The first part of this paper deals with the results of an extensive research covering all the available literature dealing with the subject, and presents a summary of all the significant facts that can be drawn from such a survey, together with a discussion of the various theories concerning laccoliths which have been held by students of the subject. Several new ideas are advanced by the author, and the chief factors governing the formation of laccoliths are discussed critically.

Part two is an account of a series of experiments carried out in the Geological Laboratories of the University of North Carolina with the aid of certain apparatus designed and constructed by the author; these experiments being intended to test so far as possible the conclusions recorded in part one. These are, in a large proportion, borne out experimentally, and several rather unexpected phenomena are noted.

At the end of the paper is appended an extensive bibliography which covers all of the more significant literature dealing with laccoliths.

The more important conclusions reached during these investigations were:

1. Viscous magmas, and especially magmas whose viscosity increases during the period of intrusion, are extremely favorable to the development of this type of intrusion.

2. Laccoliths are invariably intruded either into shale formations overlain by competent sandstone or limestone horizons, or along planes of unconformity overlain by similar strata.

3. The igneous cores of the greater number of laccoliths are composed of medio-silicic porphyries, due probably, to the viscosity of this type of rock when molten.

4. Thick-bedded strata favor the development of the steeply convex type of laccolith, while the sharp-edged and concave-sided type develop only in thin-bedded horizons.

5. The shape and character of the intrusive mass is greatly influenced by the nature of the conduit.

6. The temperature of the magmas during intrusion seems to have been comparatively low, and contact-metamorphic effects are feeble.

7. Excessive speed of intrusion which does not allow time for the readjustment of internal stresses will cause the formation of intrusive stocks rather than laccoliths.

8. In extremely thin-bedded strata *sills* will form unless the magma is extremely viscid.

9. The shape and character of the underlying intrusive mass is indicated only in the most general way by the dome impressed upon the superincumbent sediments.

10. The location of the conduit may be very eccentric, while the point of greatest thickness almost invariably lies over the center of the mass.

## THOMAS E. POWELL. The Geology of the St. Mark's Quadrangle.

The St. Mark's quadrangle is located about two miles south of Elon College, N. C. It is in the form of a square and contains 379 acres. It was chosen because it is typical of the geology of this vicinity.

The area is comparatively level for the Piedmont section, occupying as it does, a position on the pemplain. There are a few well rounded hills, monadnocks, and gently sloping valleys. The topography affords natural drainage. Erosion is excessive only in a few instances, and in these cases is due to poor management on the part of the land owners.

The soils of this quadrangle are of the two common types—sedentary and transported. The sedentary soils are those most common in the section and have been formed in place by the disintegration of the underlying strata. The transported soils consist of those that have been moved from their place of origin, and are found as a narrow strip along the banks of the streams.

The types of soil, depending upon the kind of mother rock, are the Durham, Iredell, Davidson and Congaree. The Durham soils are inextensive and are used largely for tobacco and cotton. The Iredell series covers more area than any of the others. It is adapted to pasturage and meadow land. The Davidson type is the strongest one from an agricultural standpoint in the St. Mark's Quadrangle. The Congaree soils lying along the streams are poorly drained and are used exclusively for pasture lands.

The rocks of the St. Mark's Quadrangle are of Igneous origin. They are a part of a laccolith. On account of the depth of intrusion, the magma was slow in cooling, the result being rocks of a granitoid texture. The conclusion reached is that the rocks are all due to a common magma, but that the work of differentiation before the time of consolidation, produced the two families found. The two families—granite and diorite occur in well defined zones. There are three granite zones interlaced by two diorite zones. The granite rock is composed of quartz, orthoclase feldspar and muscovitic mica, feldspar predominating. The diorite contains feldspar and hornblende. The feldspar grains are larger than those of hornblende. One basic dike was found cutting across the area. It was considered by the author to be a portion of the diorite material in connection with the diorite outcrop.

## DEPARTMENT OF GERMANIC LANGUAGE AND LITERATURE

E. C. METZENTHIN has contributed articles to two scientific journals as an outgrowth of his studies on Old Saxon.

A contribution to the *Journal of English and Germanic Philology* (July, 1924), based on the newest work on the Old Saxon Heliand, "Altsächsisch" by Otto Basler (Freiburg in Breisgau, 1923).

The essay gives a detailed survey of the contents and a critical analysis of the method of Basler's book. The author points out the deplorable lack of interest in Old Saxon language and literature among English scholars and students, suggests means of arousing such interest, one of them an improvement in the methods of teaching Old Saxon and of reading Old Saxon literature with university classes in America.

The Heliand, A New Approach. *Studies in Philology,* July, 1924.

The introduction characterizes the atmosphere in the Carolingian Empire surrounding the Heliand and its author in the first half of the ninth century A. D. The first section gives a critical survey of the literature on the Heliand, culminating in the statement that none of its important problems has been solved in spite of a century of continuous labor by many Germanists. The second section proposes and applies a new method of approaching one of the major problems—whether the unknown author was a cleric or a layman. This method consists in the collection, investigation and grouping of all the "deviations" of the Heliand from its sources.

Dr. Metzenthin's study will be continued in one of the following issues of *Studies in Philology.*

DR. METZENTHIN read a paper on "The Value of Semitic Language and Literature for the Study of Comparative Philology" before the Philological Club of the University of North Carolina at its meeting in May, 1924.

The purpose of the paper was to urge the value of introducing Semitics and particularly the study of the Hebrew Old Testament in every university. The treatise showed further the neglect of Semitics in the teaching of Comparative Philology which latter is usually restricted to the Indo-European or Aryan family of nations despite the greater age of the Semitic languages. Semitic languages are also valuable for Comparative Linguistics

in having numerous peculiarities which represent either instructive parallels to, or striking divergences from, the linguistic structure of the Aryan branch.

Moreover, the influence of Semitic literature is not inferior, in some spheres is even superior, to that of the Greek or Roman writings, as is manifest in the fields of astronomy, mathematics, law, art and, above all, religion.

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## DEPARTMENT OF HISTORY AND GOVERNMENT

J. G. deRoulhac Hamilton is still engaged in editing *The Papers of Randolph Shotwell,* the first half of which is now ready for the press. The second part, dealing with Shotwell's career during Reconstruction and his prison life at Albany, will probably be completed during the coming year.

Henry McG. Wagstaff is reading the final proof of *Letters of John Steele,* which will be pubished by the North Carolina Historical Commission.

W. W. Pierson, Jr. published, in the January 1924 number of the *North Carolina Law Review,* an article entitled "Is There a Republican Form of Government?" This article is a survey of opinion on the republican form of government and is intended as the introduction to a forthcoming work on the Guarantee Clause of the United States Constitution. During the coming year Dr. Pierson will prosecute an investigation in Hispanic American history and government. He will spend the year in South America and in Spain.

R. D. W. Connor is collecting material for a biography of Zebulon B. Vance.

Frank P. Graham, who was awarded an Amherst fellowship for two years, spent the past year in Washington, doing special work in economic history. He will spend the coming year in England, France, and Germany, continuing an investigation of the electrical revolution.

A. R. Newsome is at work on "The Southern Negro During the Civil War." The purpose of this study is to determine more

clearly the inter-relations of the war and the institution of negro slavery and the role of the negro in the South during the struggle.

R. H. TAYLOR has in preparation a study entitled "Slave-holding in North Carolina: An Economic Survey."

D. H. GILPATRICK is at work upon a study of the "Rise of Jeffersonian Democracy in North Carolina." This work will cover the half century from 1776 to 1826, and will be an attempt to trace the adoption within the state of North Carolina of those principles advocated by Thomas Jefferson in national politics.

C. C. NORTON is engaged in a study of the Democratic Party in North Carolina from 1824-1860.

The following Master's Thesis was accepted by the Department in 1923-24.

FRANCIS CHARLES ANSCOMBE. The Work of the Baltimore Association; The Quakers and Reconstruction in North Carolina.

This thesis, consisting of ten chapters, deals with the activities of the "Baltimore Association for the Relief of Distressed Friends (Quakers) in the South during the Reconstruction Period." After mentioning the early settlements of Friends in North Carolina, their attitude toward war and slavery, the early educational conditions, and the general situation at the close of the Civil War, the writer deals with the origin of the Association. Many Quakers arrived at Baltimore in a destitute condition. Under the leadership of Francis T. King the Association was organized. Commencing with the alleviation of immediate needs, the Association extended its ministrations to those Quakers who remained in the South. Provisions, clothing, and supplies of all sorts were distributed.

The need of schooling claimed attention, and there was evolved a complete graded system, embracing over sixty schools, which were operated from 1865 to 1885, and which extended from the coast to the mountains. In some years over three thousand children were cared for. The value of this labor may be realized when it is asserted that at that time no other system of education existed in North Carolina.

Assistance was also rendered at a critical time to New Garden Boarding School (later Guilford College). Other educational activities included a Normal School (said to be the first in the state), a Normal School for Sunday school teachers, elementary schools in Eastern Tennessee, and schools for negroes.

The Association also took steps to improve agriculture. A Model Farm was operated for about fifteen years, and many new agricultural methods were thus introduced into the state.

Another phase of the work of the Association appears in the reconstruction of meeting houses. These operations extended throughout eight states and Canada. In all fifty-eight meeting houses were aided.

Not the least valuable result of the work of the Association was the stemming of the westward tide. Quakers had been leaving the state by hundreds. The new hope engendered by the Baltimore Association encouraged many to remain. Thus North Carolina Yearly Meeting of Friends and Guilford College were saved to the state.

The writer gives sketches of the three leading characters, Francis T. King, Joseph Moore, and Allen Jay, all men of capacity and distinction.

A financial statement is appended, showing that of the $138,300 raised and expended upon the work, $55,000 was contributed by British Friends; $36,000 was spent upon Relief and the Model Farm; $72,000 went to the Educational system; $23,000 was raised for New Garden; and $7,300 for meeting houses. The writer was fortunate in being able to gain access to the original records of the Association.

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## DEPARTMENT OF LATIN

GEORGE HOWE read a paper "History and Legend in the Aeneid" at the annual meeting of the Southern Section of the Classical Association of the Middle West and South, which was held in April, 1923.

The paper shows that in the Augustan Age the Epic was considered to be historical in character; that Vergil, in choosing a mythological subject, was obliged to run counter to this idea; and that he satisfied the ideas of his contemporaries by including in the Aeneid an astonishing amount of historical material.

G. A. HARRER published the following:

The Chronology of the Revolt of Pescennius Niger, in *The Journal of Roman Studies,* X, 2, pp. 155-168.

In this paper a study is made of the intricate problem of the proper dating of the revolt of the Syrian governor, Niger. It was called forth by the appearance of two studies of the same topic, one in England, by Maurice Platnauer, and one in Germany, by J. Hasebroek. The conclusion is reached that the revolt probably came to an end early in the year 194 A.D.

A Meaning of Religiosus, in *Classical Philology,* XIX, 1, pp. 83-84.

In legal Latin the word *religiosus* is found to have the unusual meaning "devoted to the gods of the world below."

Mr. Harrer expects soon to publish a paper on "The Site of Cicero's Villa at Arpinum," and a note on "The traditional Site of Cicero's Tusculanum." He is finishing work on a supplement to W. Liebenam's *Fasti Consulares Imperii Romani,* and has begun work on a translation and edition of Liudprand's *Relatio de Legatione Constantinopolitana,* a narrative from the tenth century.

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## DEPARTMENT OF MATHEMATICS

During the year the Department completed the following studies:

ARCHIBALD HENDERSON, A. W. HOBBS AND J. W. LASLEY, JR. The Theory of Relativity. The University of North Carolina Press.

The purpose of this volume is to present a lucid and self-contained development of Relativity, special and general, together with the necessary treatment of Riemannian manifolds, the quadratic differential form, and the theory of tensors. The theory of tensors has been developed *ab initio* and with elaboration sufficient to build up the General Relativity Theory. An investigation of the subject of curvature has been carried out, giving an account of curvatures of various types, the relations between them and their bearing on the Relativity Theory. There is a long and deep historical background to Relativity; and Einstein's generalizations rest on the solid ground of authenticated experiments. A few of the most significant and fertile of these have been touched on, and their relation to Relativity has been shown. This volume, as far as it goes, contains the essentials of Relativity. It may be read understandingly by the mathematician, without reference to any other work.

ARCHIBALD HENDERSON has published:

Relativity—A Romance of Science. *Extension Department Monograph.*

This monograph, fully illustrated, constitutes a "popular" or simplified exposition of the Relativity Theories, both special and general, for the average reader with a modicum of mathematics at his command.

The Size of the Universe. *Science.* September 7, 1923.

This study, the presidential address before the North Carolina Academy of Science, embodies the results of certain investigations made in connection with the work of the Graduate Seminar. It consists of a thorough-going survey of the contemporary theories regarding the scale of the visible universe, with especial reference also to the finite, unbounded universe of the Einstein cosmology, in pseudo-spherical space.

Newton Versus Einstein: a Battle of Giants. *The International Book Review.* November, 1923.

A vigorous controversy has been waged for some time between the adherents of Newton and the champions of Einstein. In this review of Professor Charles Lane Poor's volume, "Gravitation versus Relativity" (Putnam) Mr. Henderson has outlined the main points of this controversy.

Aspects of Constant Curvature. Paper before the Academy of Science.

In this paper was outlined a number of ways of determining the Gaussian curvature on surfaces of constant curvature. This was shown to be intimately associated with the expression for the linear element on a surface. Making use of the two expressions given by Riemann for the linear element of a surface of constant curvature, it was shown by appropriate examples how the curvature could be singled out by inspection. Illustrations were given for the sphere, written three different ways, parametrically, and for the pseudo-sphere as compared with the sphere of imaginary radius. Attention was called to the fact that little had been done in this direction; and that there was room for the display of great ingenuity in devising parametric representation of surfaces suitable for the purpose of defining curvature.

Mr. Henderson during the past year has been on leave in England and Germany pursuing further his studies on the theories of Einstein.

J. W. LASLEY, JR. Some Special Cases of the Flecnode Transformation of Ruled Surfaces. The University of Chicago Press.

An account of this study is given in some detail on page 39 of the University of North Carolina Research in Progress Bulletin number 188.

On the Curvature of Manifolds. A paper before the North Carolina Academy of Science.

A surface may be regarded as a two-parameter family of points. Its linear element is then given by a quadratic differential form in two variables. We regard surfaces thus characterized as manifolds of two dimen-

sions. Extending these notions to higher dimensions, we consider differential forms in any number of variables as characterizing manifolds of the same number of variables. The problem of measuring the curvature of manifolds of more than two dimensions has received comparatively little attention. What has been done on the subject is not readily accessible. In the case of four dimensions the matter is highly important in the Relativity Theories. The present paper studies the more important measures of curvature that have been suggested for manifolds of higher orders, takes up their relations one to another and gives numerous examples.

Mr. Lasley is engaged in the study of the osculating quadrics to the surfaces of the flecnode suite.

A tangent plane to a surface meets it in a curve with a double point at the point of contact. If this double point is of such a nature that one of the double point tangents is also a flex tangent, the point has been called by Cayley a flecnode. Ordinarily a ruled surface has two such points on each generator, giving two flecnode curves. The tangents to the asymptotic curves through the points of one of these flecnode curves leads to a flecnode surface. This surface, being ruled, has in turn its flecnode surface, and so on. We have in this manner a flecnode suite of surfaces. To a given generator on the original surface there corresponds usually on each ruled surface of the suite a definite generator. On a surface that is ruled a generator with two other distinct generators determine a quadric. As the generator is approached by the two remaining generators, this quadric ordinarily approaches a definite quadric, known as the osculating quadric along this generator. For each ruled surface of the flecnode suite there is an osculating quadric at the corresponding generator. There is thus formed a suite of osculating quadrics. The present investigation is a study of this suite.

E. T. BROWNE is making a study of certain symmetric and skew symmetric orthogonal matrices.

An orthogonal matrix is a square matrix which has the properties: first, that the sum of the squares of the elements in any row (or column) is equal to unity; second, the sum of the products of corresponding elements in any two distinct rows (or columns) is equal to zero. In a more general sense we may consider as an orthogonal matrix any matrix which satisfies the second condition above, but for which the first condition is altered in that the sum of the squares of the elements in any row (or column) is equal to any given positive number. There exist certain orthogonal matrices which are also symmetric and others which are also skew-symmetric. However the latter exist only when the number of elements in a row (or column) is even. In any case if S is an orthogonal matrix which in addition is either symmetric or skew symmetric, then S possesses the property that its square is the product of a scalar by the identity matrix. From this relation it is

clear that S is the matrix of an involution. It is the purpose of this study to investigate the properties of such matrices with the view of applying them to the theory of involutions.

The Department has approved the following master's theses:

FLORA HARDING EATON. The Rôle of the Cross Ratio in Projective Geometry.

Because of certain inherent properties the cross ratio plays a fundamental role in projective geometry. Its invariance under the processes of projection and section make it ideally suited as the basis for a projective coördinate system. It occurs insistently in geometric situations where projective properties are under consideration. The present paper makes a study of this cross ratio notion. The properties that give it such prominence are listed and discussed. The projective coördinate system, the language of analytic projective geometry, is developed in detail for typical projective forms, and the intimate relation between these frames of reference and the cross ratio notion is pointed out. Numerous examples of the cross ratio in geometric situations are given, among which are the theorems of Pappus and of Von Staudt and the extended theorems of Menelaus and of Ceva.

C. H. BENSON. Some Constructions Used in Projective Geometry.

Projective construction, sometimes called linear construction, deals only with projective properties, which are defined as those properties which are invariant under projection and section. Since metric properties are not employed in linear construction, only the straight edge is used. Projective construction plays an important part in synthetic projective geometry. In some cases important theorems, such as Pascal's Theorem, are proved synthetically. In other cases construction greatly facilitates proof by analysis.

The purpose of this study is to present in concise form the principal constructions used in projective geometry, giving proofs whenever necessary. An effort has been made to adhere to linear construction exclusively, although metric construction is sometimes used as an aid in the projective construction. The constructions presented have been divided somewhat arbitrarily into three groups: general constructions, constructions based on the conic, and those dealing with the involution.

G. S. BRUTON. Some Applications of Projective Geometry to Elementary Mathematics.

The purpose of this paper is to point out a few of the applications of projective geometry to elementary mathematics and to review some problems and theorems in trigonometry, algebra and analytic geometry in the light of projective geometry. A fundamental notion in projective geometry

is a one to one correspondence and it has many applications in elementary mathematics. For example, there is a one to one correspondence between real numbers and points on a line. One to one correspondence leads directly to the study of the projective coördinate system which has the Cartesian system as a special case.

The chief geometrical applications are found in projection, since many problems and theorems have been very much simplified by its use. Only orthogonal projection has been discussed as all of the projections necessary have been orthogonal. A section has been devoted to the ideal elements in geometry because by their introduction many difficult questions in elementary mathematics have been made clear. A good example is found in the solution of a set of linear equations where the determinant of the coefficients is zero. By making the equations homogeneous they are found to have a perfectly definite solution which involves no division by zero.

The algebraic applications are found in the treatment of conics where the projective geometry methods of approach have been discussed rather than the ordinary methods of analytic geometry. A classification of conics has been made according to the nature of their intersections with the ideal line.

## W. V. PARKER. Fundamental Properties of Symmetric and Skew-Symmetric Determinants and Matrices.

Determinants and matrices occupy a very important place in mathematics. Two types that are of especial interest are the symmetric and skew-symmetric. A symmetric determinant or matrix is one in which the elements of corresponding rows and columns are identical. A skew-symmetric determinant or matrix is one in which the elements of corresponding rows and columns are equal but opposite in sign.

The purpose of this study was to collect and present proofs of the fundamental theorems of symmetric and skew-symmetric determinants and matrices. The three theorems that are of most interest are:

I. A skew-symmetric determinant of order $n$ is always zero or a perfect square according as $n$ is odd or even.

II. The characteristic equation of a symmetric determinant has only real roots.

III. The characteristic equation of a skew-symmetric determinant has no real roots other than zero.

## DEPARTMENT OF PHARMACOLOGY

W. DEB. MACNIDER has completed the following studies:

Concerning the Selective Affinity of Drugs. To be published in *Southern Medicine and Surgery.*

Many drugs pick out definite structures upon which to act. Spinepherin selects the endings of the post-ganglionic fibers of the sympathetic nervous system. Curare acts on the endings of motor nerves. The explanation for such selection is not known.

The general anesthetics, ether and chloroform, pick out the brain and spinal cord on which to act and establish a state of anesthesia. Meyer and Overton have attributed the localization of this action to the presence in such tissue of lipoid material in which the general anesthetics are soluble. Researches in this laboratory have shown that the general anesthetics show a variable degree of affinity for the renal epithelium and that this affinity shows a correlation with the amount of stainable lipoid material in these cells. Furthermore the administration of a solution of sodium carbonate to an animal causes a decrease in such material in the renal epithelium and decreases the affinity of the anesthetic for the kidney and thereby protects the organ against the toxic effect of the anesthetic.

A Review of Experimental Nephritis. To be published in the October issue of *Physiological Reviews.*

Dr. MacNider has the following studies under way:

The toxic Effect of Alcohol for the Kidney.

The Effect of Insulin in Acute Uranium Intoxications.

The Value of Gum-Saline Solutions in Treatment of Shock.

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## DEPARTMENT OF PHARMACY

E. V. HOWELL has conducted the following studies:

Indian Remedies of Western North Carolina. Presented before the American Pharmaceutical Association, Asheville.

The Indian names together with the botanical names were given; also a short description of plants and the diseases for which they were used.

Medicinal Plants of North Carolina. Presented before the American Pharmaceutical Association, Asheville, N. C.

More than 500 drugs were exhibited. A sketch of the botanists collecting in the State from 1789 to 1825 was included. Also a short history of the crude firms of the State, and a list of the medicinal plants they deal in.

Yaupon. Use as tea with assays for caffeine in North Carolina and South Carolina plants. Presented at Asheville meeting of the American Pharmaceutical Asociation.

MR. HOWELL has the following studies under way:

Cinara, Carduus and Scalymos of the Ancients.

The Use of Silica-gel as a Clarifying Agent.

The Cultivation of the Opium Poppy and its Morphine Content.

The Early Life of Henri Harrisse, the distinguished historian. Instructor in French, University of North Carolina, 1853-1856.

E. V. KYSER has published the following during the year:

Formulae for Potassium Free Soft Soaps. Frank C. Vilbrandt and E. V. Kyser. *Chemical Age,* 31, 381 (Aug., 1923).

A systematic study was made of soft soaps by the additions and substitution of sodium compounds for the commonly used expensive potassium for the purpose of producing a better and less expensive detergent. Several desirable formulae were found.

Preliminary Report on the Effect of Fatty Acids on Liniments and Emulsions. E. V. Kyser and Frank C. Vilbrandt. *Journal of the American Pharmaceutical Association,* 13, 433, (May, 1924).

One of a series of studies on the effect of the formation of soluble soaps by the action of alkalies, their salts, and soluble silicates on free fatty acids in fixed oils. The amount of soap formed by such action is capable of forming emulsions of different viscosities depending upon the percentage of free acid and alkali used.

MR. KYSER has the following studies in progress:

Concerning the Behavior of Gastro-intestinal Enzymes in the Presence of Certain Antiseptics.

Part 1. Pepsin on Egg Albumen (with C. R. Whitehead).

Part 2. Pancreatin on Starch (with H. E. Whitemire).

Part 3. Pancreatin on Milk (with P. H. Thompson).

Some Critical Points of Emulsification in Oil-Soap Emulsions (with F. C. Vilbrandt).

Applications of Hydrogenated Oils in Pharmacopoeial Preparations.

## DEPARTMENT OF PHILOSOPHY

During the year the Department accepted the following doctoral dissertation:

ANNA FORBES LIDDELL. The Logical Relationship of the Philosophy of Hegel to the Philosophies of Spinoza and Kant.

The writer affirms that in order to comprehend the principles of Hegel's Absolute Idealism, it is necessary to study it in relation to the philosophies of Kant and Spinoza. These two systems are, from the Hegelian point of view, mutually contradictory. The method of Hegel is essentially the method of the dialectic. The movement of the dialectic displays itself in the synthetic process of unifying Kant's subjective idealism with Spinoza's objective absolutism. Kant might be said to have given Hegelianism its form; Spinoza, its content.

According to the Critical Philosophy, thought is a synthetic process *a priori,* which forms its own objects and brings them together in a continuity of experience. This process, however, is not absolute creation. Thought does not make the object, but transforms the *Ding an sich* into an object. There is a given, although unknown and unknowable, stuff, which is the basis of all sensible experience. These objects of thought which have no sensible content, pure ideas, such as *God, freedom,* and *immortality,* are indeed, pure creations of thought, but for that very reason they are, according to Kant, merely hypothetical. They are practically necessary and, therefore, as regulative principles, true, but their truth is not demonstrable. Thus thought, though absolute in its own field, is limited to pure subjectivity.

The system of Spinoza sets forth the doctrine of Absolute Substance. It is a philosophy of Pantheism at its highest stage of development. There is one Substance or Being, God, and whatever is, exists in and of God, as a necessary modification of his attributes, 'thought' and 'extension.' The greatest flaw to be found in the philosophy of Spinoza is that it is static. He asserts that the finite modifications of infinite Substance are necessary without showing why they are necessary, for the relation between the One and the Many, as set forth in his system, is not reciprocal. The infinite is displayed in the finite, but the finite manifestations, in and of themselves, have no reality. Accordingly, his theory is a system of law and necessity, not of free development.

The writer does not pretend to make a complete exposition of either the philosophy of Kant or that of Hegel, but only to present those systems as they enter into Hegelianism. Not all of Hegel's criticism of his predecessors is taken into account; for the problem is not so much concerned with Hegel's opinion of Kant and Spinoza as with tracing their influence upon his thought and with showing how he developed ideas which they implied but failed to carry through to a logical conclusion. Accordingly, both Kantianism and Spinozism are presented from a frankly Hegelian point of view.

After the essential features of these two philosophies have been set forth, this essay undertakes to show how Hegel unified Spinoza's objective Substance with Kant's subjective process, or 'Ego.' Through the unity of the static and the dynamic originates the organic. Thought is not limited by an unknowable *Ding an sich,* for reality is not duality but unity. The object essentially is what it is in and for thought. Substance itself is but a category of thought, therefore, the Absolute is not Substance but Idea. But the Absolute Idea is not mere subjectivity, for subjectivity is limited by 'externality.' 'Externality' is not extraneous stuff but the idea of objectivity, and as such an integral moment in the unfolding of the Idea, the process of reality, through which 'Consciousness' becomes 'Self-consciousness.' Absolute thought is shown to include its object in itself. This, the unity of subject and object, is *Geist,* which manifests itself in the reciprocal relation of the One and the Many, the infinite and the finite. These manifestations of *Geist* appear in the physical universe and in the course of civilization.

The present essay does not undertake to trace the development of *Geist;* the problem with which it is concerned is to show how the principle of *Geist* takes its rise. For the study is intended to be an introduction to the Philosophy of Hegel, rather than a complete exposition of its theory.

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## DEPARTMENT OF PHYSICS

### OTTO STUHLMAN, JR. The Minimum Velocity of Impact to Produce Secondary Electron Emission from Tungsten. Read at the Cincinnati meeting of the American Physical Society. December, 1923. Published in the *Physical Review,* Vol 23, p. 296, 1924.

A three-element vacuum tube with tungsten filament, grid and plate was used. Secondary electrons were obtained from the tungsten grid through bombardment by means of thermions accelerated by the potential gradient between grid and filament. To the negative end of the filament was attached a variable negative potential, in series with a galvanometer and the grid, the latter being positive with respect to the filament. A high potential was connected with its positive end to the plate and negative end to the positive end of the grid battery. This kept the plate potential always at a constant positive potential higher than the grid. If secondary electrons were emitted they passed from the grid to the plate and were detected as a decrease in the deflection of the galvanometer. Hence the secondary emission was indicated by a break in the potential-current curve. By connecting the breaks for various filament currents by a straight line an intercept on the voltage axis was obtained which was interpreted as the potential at which secondary emission set in for electrons leaving the filament with zero initial velocity. For tungsten this minimum potential was found to be 3.72 volts.

OTTO STUHLMAN, JR. The Radiatron as a Source of Negative Electric Resistance. Read at the Washington meeting of the American Physical Society. Published in the *Physical Review*, Vol. 21, p. 717, 1923.

D. A. WELLS AND O. STUHLMAN, JR. Secondary Electrons Produced by Electronic Bombardment of Metals. Read at the North Carolina Academy of Science, May, 1923. (Preliminary paper).

The electron vacuum tube used in this work was furnished through the funds of the Graduate School Research Fund.

DR. STUHLMAN has the following study under way: Extra-Ultra-Violet Spectra of Some of the Metals.

The following theses for the Master's degree in the Department of Physics were presented in June, 1924:

MILTON L. BRAUN. Equipment for the Teaching of Physics in Secondary Schools.

School laboratory work in physics is a modern science in which many problems are still unsolved. Its early gradual development was given an artificial impetus about a generation ago and the uncommendable, as well as the beneficial, results of this stimulus still prevail in our middle schools. The writer has followed the status of physics teaching throughout this period in educational journals and treatises. Numerous texts and manuals on physics, besides the older texts on Natural Philosophy, have been studied. Personal observation and experience have been drawn on and other physics teachers consulted. As a result that portion of an ideal first-year course which pertains to the use of equipment in class or laboratory experiment has been outlined.

D. A. WELLS. Secondary Electron Emission from Metals.

A vacuum tube was designed, built and put into operation by means of which any one of six metals, (aluminum, iron, nickel, copper, silver and gold) could be bombarded by electrons from a hot tungsten filament and the character of the secondary emission studied. The apparatus provided an easy means of obtaining separate values of the primary electrons striking the metal under investigation and current densities of the re-emitted or secondary electrons. Also a very convenient way of changing metals under investigation without going into the tube or lowering the vacuum, was provided, thereby making it possible to obtain results on all the metals under exactly the same physical conditions.

The problem as investigated includes, in its entirety, the following:

1. Secondary velocity distribution from nickel and aluminum. Curves for this show that, for a fixed primary velocity, there is always a slight number of secondary electrons with a velocity approaching that of the primary beam.

2. Maximum secondary velocity as a function of primary velocity. A curve representing this indicates that for primary velocities up to approximately 200 volts, the maximum secondary velocity is proportional to the square of the primary velocity.

3. The ratio of total secondary to primary electrons as a function of primary velocity for the different metals up to 350 volts, primarily velocity. In every case the ratio increased rapidly for low primary velocities but for higher values much more slowly, reaching practically a constant value and in some cases decreasing slightly. The maximum ratios obtained for the various metals are as follows; Al. 1.96, Fe 1.81, Ni 2.06, Cu 2.60, Au 2.38.

4. The primary voltage at which the extrapolated value of the above mentioned ratio became zero was taken as the approximate ionization potential for each metal.

5. An extension of the problem to determine the possibilities of using the same apparatus as an indirect means of locating the more prominent spectral lines of the metals lying between the ultra-violet and X-Ray regions. Carefully determined values of Is/Ip as a function of primary velocity showed distinct breaks in the curve of plotted values. An application of the voltage at which the breaks occurred to the quantum equation, $eV=hn$, in the usual way, gave from a number of test curves frequencies approximating those obtained by Millikan and others.

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## DEPARTMENT OF PSYCHOLOGY

J. F. DASHIELL is at work on the problem of *Einstellung,* specifically the development of laboratory technique for its measurement as a factor operating in adaptation to different learning tasks.

He has contributed book reviews to the *Journal of Abnormal Psychology and Social Psychology,* and abstracts of current articles to the *Psychological Bulletin.*

H. W. CRANE has been continuing work in the method of free chain association.

F. H. ALLPORT has continued his work in the fields of social psychology and the psychology of personality. A paper entitled "The Group Fallacy in Relation to Social Science," which

was read before the American Sociological Society in Washington, D. C., in December, dealt with the basic position of the psychology of the individual in social causation. This paper has been published in the *American Journal of Sociology* for May-June, 1924. During the past year Mr. Allport's text-book, Social Psychology, was published by Houghton Mifflin Company, Boston. This work incorporates the product of research of the past few years upon the influence of the group on the behavior of the individual.

During the past year Mr. Allport has been engaged in organizing a Bureau of Personnel Research, the functions of which may be summarized as follows:

(1) The administering of mental and personality tests to students entering the University, and the analyses of the results for purposes of educational guidance; (2) the development and application of tests of special aptitudes and traits important in the vocational guidance of students; (3) the devising of methods for the promotion of mental hygiene and personal development among students; and (4) coöperation with the deans in special studies of individuals presenting problems of academic, social, or vocational adjustment. Research along these lines will be continued during the coming year with the assistance of a graduate teaching fellow.

Thus far Mr. Allport's activities in connection with the Bureau have been as follows: Complete bibliographies and sets of testing material useful in student personnel work have been assembled. Some analysis has been made of the results of freshmen tests and rating scales, showing that the brighter students are, on the whole, both failing to make full use of their capacities and neglecting the development of traits measured on the rating scale under the headings of tenacity (perseverance) and high ambitions. A number of intensive studies by voluntary interview have been made of students deficient in their studies, and analyses of factors of personality involved in their failure submitted to their dean. Other cases have been studied with a view to alleviating mental difficulties and suggesting vocational advice. The early and tentative conclusions from this work were presented in a paper read before the Vocational Guidance Conference of the National Research Council, held in Washington, D. C., in May, 1924.

In connection with the Bureau of Personnel Research Mr. Walter L. Hinman has given fairly complete and successful psychoanalyses to ten students who came voluntarily for such treatment. He has given interviews for advice in mental hygiene problems to about twenty others.

Mr. Allport has continued his editorship of the *Journal of Abnormal Psychology and Social Psychology,* a periodical devoted to research and theory in the branches of psychology indicated.

The following master's theses were accepted during the year by the Department:

ARTHUR BENJAMIN CULBERTSON. Some Experimental Work in Mental Set.

Individuals differ from each other in the quickness with which they get into the mental set for a piece of work. They differ also in their ability *in* the work. Do these two lines of difference parallel each other: is he who most quickly gets *into* a task likely to be the fastest *in* that task? The question was approached with the use of printed arithmetical examples and group intelligence tests, each arranged in two forms, the continuous and the mixed. Definite negative correlations were found between ability in a task and quickness in shifting from one task to another.

HERMON WILKES MARTIN. A Radical Modification of the Maze Problem.

The essential modification employed in the maze as used for this experiment with white rats eliminates the "invitation" to the animal to repeat within the same trial old errors, or errors already passed. The plan is applied to the regular Hampton Court maze, a much used form of experiment in learning, and consists in placing at significant points in the pathways doors that can readily be closed behind the animal as he progresses, so that his explorations will be continually exercised in the forward or goalward direction.

It is seen then that while no guidance either mechanical or manual is given the animal as he proceeds, back-tracking is prevented. The main purpose thus achieved is that of making the learning of the maze more analogous to the usual learning process, in that the possible errors are now presented in a serial or one-way pattern—as is true of all other learning experiments.

A control group of animals, without the use of the doors, was run in conjunction with the experiment group. The findings with this experiment indicate four important facts. (1) A comparison of curves of learning between the two groups shows a significant reduction in the irregularity of the learning process by the introduction of the innovation for this experiment. (2) The time taken for learning was cut down markedly, and likewise, the number of trials required to master the maze. (3) It is seen that the white rat is a dependable subject for experiments in learning, and that the irregularities of reaction heretofore attributed to the animal as a subject are more correctly chargeable to the nature of the maze as a learning

problem. (4) Results (1) and (2) together, in connection with a study of tables and curves of comparison between the two groups, reveal very clearly again the relation of frequency of errors repeated in the beginning to the later learning in the same process. Thus, the much greater irregularity of the learning curve for the group with which doors were not employed, and the longer time in number of runs or trials required by this group to perfect their runs, evidence the deleterious influence of the repetitions of the backward errors they were permitted to make.

## WILLIAM WHITE ROGERS. Correlations Between Estimated Interests, Estimated Abilities, and Measured Abilities of High School Pupils.

The problem is that of correlations between interests and abilities of high school pupils. The pupils of the Mount Olive school were used as subjects. They were asked to rank their interests from one for the best liked school study to five for the least liked study. In like manner, they were asked to rank their abilities in school subjects as they estimated them. Both these rankings were for the school studies that these pupils had that year, 1922-1923. The rank for measured abilities was secured from the scores that the pupils made on standard tests, and from examination grades. The standard tests and examinations were given at the close of the fall semester, ten weeks after the pupils had given their ranks for interests and abilities. The ranks for the measured abilities were changed into percentages from the lowest to the highest and these into P. E. distances from the class median by means of a table for converting percentages into P. E. distances from the median by M. R. Trabue.

Each of the three possible relations,—between estimated interests and measured abilities, between estimated abilities and measured abilities, and between estimated interests and estimated abilities—were entered in the correct position on a separate graphic table, and the correlations worked out by the Brevais-Pearson Product Moments method for computing correlations. They were:

Correlation between estimated interests and measured abilities..... .173
Correlation between estimated abilities and measured abilities..... .240
Correlation between estimated interests and estimated abilities..... .680

These correlations are lower than similar ones secured for college students. The author does not claim that they are without error, as several sources of error that could have modified the correlation appear. After two checks on these sources of error, the author is inclined to think that correlations between interests and abilities for high school pupils are not high. As a reason for the low correlations, the fact that high school pupils are not as

select a group as college students are, is suggested. Another factor that may have modified the correlations is that correlations between interests and abilities for high school pupils are not constant, that influences such as heredity, environment, occupation, and vocational interests modify these correlations. This statement will have to be verified, however, by other experiments similar to this.

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## DEPARTMENT OF ROMANCE LANGUAGES

WILLIAM M. DEY is collaborating on a French grammar with Professor André Béziat of Vanderbilt University. This volume is expected from the press in the early Spring of 1925. Mr. Dey is also engaged on the following work:

1. A primer of phonetics.
2. An edition of the *Poèmes Philosophiques* of Alfred de Vigny.

STURGIS E. LEAVITT has published during the year:

*Argentine Literature.* A bibliography of literary criticism, biography, and literary controversy. University of North Carolina Press, 1924. (University of North Carolina Studies in Language and Literature, No. 1).

This bibliography is the result of researches in the libraries of Buenos Aires, particularly the Biblioteca Nacional, that of the University of Buenos Aires, and the private collection of Dr. Estanislao S. Zeballos. The titles mentioned in the study include books and articles published in Argentina, and those printed elsewhere by Argentines or men who lived in Argentina long enough to establish an intimate contact with its intellectual life. In the list figure histories of literature, autobiographies, collections of biographies, and articles and books of a biographical, controversial or critical nature. In the case of books the content or scope of the volume is indicated when the title does not make this clear, and, whenever possible, quotations from reviews have been added to throw light upon the value of the work in question. Other than this no attempt has been made by the compiler to give critical evaluations.

The following Master's Theses were accepted by the Department during the year:

MAUDE HELEN DUNCAN. Brieux: Social Purpose Dominating Art.

In this study of Brieux's dramas, an attempt has been made to show that his broad knowledge of social problems in modern French civilization, and his conscientious sincerity in presenting them to the public have led him to subordinate literary quality to social purpose.

From the introduction, which traces the rise of the pulpit theatre, and from the brief analyses of twenty-three dramas of Brieux, it may be seen that he continues the tradition of Diderot and Dumas fils. But he introduces to the stage themes and episodes from real life, which have hitherto been avoided or hidden.

Brieux has no general plan for the improvement of civilization, but his objectives are purer family life, larger life for women, cleaner politics, and better citizenship. Regarding social problems largely in their relation to the future, his chief concern is the interests of the child.

He is so intent upon the demonstration of a thesis that the action of his plays often lags; and on account of his unswerving realism, the bourgeois speech of his characters is often coarse and ungrammatical.

Brieux writes at a time when taste is being directed toward leveling democracy, social betterment and concern with the affairs of the average man. These sentiments of social justice animate most of modern thought.

Although in his recent dramas Brieux devotes more attention to literary style than formerly, his undiluted energy is still being given to the transference of social science to the stage.

MARY REBECCA LEARNED. The English in the Literature of France to 1550.

In spite of the fact that up to 1550 the English were known in France largely as invaders, they appear to the French writers of this period rather as a favorite object of satire than as a serious menace. The essay discusses the treatment of the English by considering the two main sources of criticism, the popular writers and the more serious writers. The popular criticism is taken from the songs, poems, and stories, as are found in the collections of Montaiglon, Picot, Le Roux de Lincy; from the collections of short stories of the sixteenth century; and from the theatre of the fifteenth and sixteenth centuries, for example, the work of Gringore. The more serious writers considered are the chroniclers, Chartier, Froissart, and Commynes; Robert Gaguin; and the court poets of the sixteenth century. In every case the treatment of the English is the same though the manner of criticism may vary.

THOMAS MORTIMER MCKNIGHT. The Life and Works of Alberto Blest Gana.

The purpose of this thesis is to give an account of the life of Alberto Blest Gana and a résumé and criticism of his works making use of data compiled by the writer during an eight months sojourn in Chile.

Due to the fact that the works of Blest Gana are not easily accessible in this country synopses of his novels have been included in the thesis together with quotations from the more important criticisms of his contemporaries. In dealing with Blest Gana's ideas it is pointed out that the people and literary critics of South America have perhaps failed to interpret Blest Gana correctly. As he was the first important writer of prose fiction in Chile, his contemporaries were too interested in his pictures of Chilean life to take cognizance of his real purpose. The majority of his novels are sharp and significant satires of Chilean society, of the social inequality of the epoch and its evils worked upon the unprivileged classes.

WYATT ANDREW PICKENS. Some Aspects of the Dramatic Art of Ruiz De Alarcón.

Ruize de Alarcôn apparently did not use the theater as a means of answering or attacking his enemies, as is commonly believed. If he did so, the objects of his attack cannot by internal evidence be identified at the present time. His plays assume the general form of the 16th century Spanish "comedia" established by his predecessors, and most of his plots are seemingly original. No attempt is made to observe the unities of time and place. Alarcón is careful to develop the exposition of his play with regard to clarity of situation. Some plays begin with rapid action but soon subside into an orderly revelation of existing conditions. The climax and even the third act are not always suggestive of the conclusion of the play, which is contrary to the tenets of good theatrical art. This departure from the artistic conclusion is explained by Alarcón's tendency to be didactic and use his "comedias" to teach some moral truth. In this respect he is quite different from his contemporaries.

Alarcón's greatest contribution to the theater is his portrayal of character. In the depiction of one character type, the 17th century Spanish gallant, he excels many of his more important contemporaries. The repetition of certain traits in the character of the gallant, as well as the recurrent use of certain names, leads to the belief that the author has endowed them with his own characteristics. His women characters are weakly drawn. In the character of the "gracioso" a departure from the practice of his contemporaries is noted. The character of the professional female go-between, so popular with the Spanish dramatists of that period, does not appear in Alarcón's plays, nor does he employ the disguised maiden as a stage device, although Lope de Vega does so with much success. We are lead to believe that Alarcón excluded these two very important characters on account of personal moral objections.

Local color plays an important part in Alarcón's technique, and an idea of the dress and customs of 17th century upper class Spanish society is obtained from his "comedias." He is careful in the stage directions concerning dress and displays a fondness for the "vestido de color" as a costume for the men. This care and taste as regards dress is not found in Lope de Vega.

J. LEROY SMITH. Some Recent Treatments of the Don Juan Legend in French Drama.

A study and comparison, with each other and with the sources, is made of three recent treatments of the Don Juan legend in French drama: Henri de Régnier's *Les Scrupules de Sganarelle* (1906), Henry Bataille's *L'Homme à la Rose* (1921), and Edmond Rostand's *La Dernière Nuit de Don Juan* (1921).

The chief sources, Tirso de Molina's *El Burlador de Sevilla* and Molière's *Don Juan ou le Festin de Pierre*, are shown in detail, the development of the legend is traced in a general way through the 17th, 18th and 19th centuries, and a detailed study is made of each of the three treatments in question, comparing them with Tirso and Molière and with each other.

Henri de Régnier's *Les Scrupules de Sganarelle* is shown to be a psychological study of character, modeled closely after Molière, presenting a moral lesson of the futility of conscientious scruples without the will-power to uphold them, and the results of a blind and romantic passion.

Henry Bataille's *L'Homme à la Rose* is shown to be a series of episodes in the life of Don Juan, who has lost all his former prestige and reputation—with no character development whatsoever, and a sensuous portrayal of illicit love.

Edmond Rostand's *La Dernière Nuit de Don Juan* is shown to be an original treatment of the legend, romantic, fantastic, mystical, showing Don Juan's disillusionment of his high conception of himself and his disappointment in being condemned to a punishment which he thinks is unworthy of him, and showing the desirability of striving after an ideal.

STERLING AUBREY STOUDEMIRE. Longfellow and Spain.

In dealing with Longfellow and his relationship to Spanish literature the discussion has been divided into two main parts: a study of his translations and a consideration of some of his original poems.

Under the first division the Spanish poems fall into two groups, literal and spiritual translations. These two different manners are analyzed from the point of view of meter, rhyme scheme, and spirit, in order to make some estimate of Longfellow's adherence to or departure from the original Spanish.

The second part of the paper deals with Spanish influences upon the original works of Longfellow. Here an attempt is made to point out sources for "A Psalm of Life," "The Spanish Student," and influences on the main scene in "The Courtship of Miles Standish."

The appendix includes a list of the original poems of Longfellow which deal entirely with Spanish subjects and those which contain casual references to Spain or things Spanish. Poems which have been translated into Spanish also receive mention here.

## T. J. WILSON, III. The Historical Discrepancies in Alfred de Vigny.

The purpose of the thesis was to point out the discrepancies of fact, thought and feeling to be found in those characters whom Alfred de Vigny borrows from history. A survey was given of the history of France from 1580 to 1643, to present a true picture of the period with which Vigny deals in his novel "Cinq-Mars," and his drama "La Maréchale d'Ancre." Afterwards, a study of Vigny's errors was made, this study being divided into five heads:

1. Distortion of the main characters in "Cinq-Mars";
    a. Richelieu,
    b. Cinq-Mars,
    c. Father Joseph;
2. Mistakes in material facts, such as dates and names, in "Cinq-Mars," concerning:
    a. Bassompierre,
    b. Urbain Grandier,
    c. L'Abbé de Gondi,
    d. Father Joseph,
    e. Marie de Mantoue;
3. Distortion of the principal characters in "La Maréchale d'Ancre":
    a. Concini,
    b. Leonora Galigaï;
4. Errors in the matter of time and action in "La Maréchale d'Ancre";
5. Incidental discussion of various historical errors in Vigny's novel, "Stello."

Vigny did not consider himself bound to follow history in minute details of fact, and, therefore, the main emphasis of the thesis has been laid on his distortion of the principal characters in his work. Vigny's natural sympathy for the nobility and hatred for Richelieu, who reduced its power, were responsible for his errors which were of considerable importance in regard to his main characters.

## DEPARTMENT OF RURAL SOCIAL ECONOMICS

E. C. BRANSON spent twelve months in Europe, March, 1923 to April, 1924, investigating farm life in Germany, Denmark and France. The results of these field investigations appeared in the *University News Letter,* Vol. IX, No. 33 to Vol. X, No. 40. They consist of twelve chapters on Country Life in Germany, twenty chapters on The Country End of Denmark, and four chapters on The Farm Civilization of France, five years after the Great War. These thirty-six chapters are now being finally revised for publication in book form by the University of North Carolina Press. The studies are not statistical or not mainly so; they are studies of farm conditions and practices, the ideals of farm home and farm village life, the social condition of the farm populations, their prosperity and place in the reconstruction of Europe.

The newly published Year-Book of the North Carolina Club bears the title of What Next in North Carolina, 128 pp. University of North Carolina Press, April 1, 1924. It is free to North Carolinians, price $1.00 postpaid to others as long as the edition lasts.

Three county bulletins have been published in editions of 3,000 each and mailed out free of charge to North Carolinians applying for them in time. They are from ten to twelve chapters each, on the economic, social and civic problems of these counties. They throw a flood of light on the conditions that have made and are still making local history.

In addition eighty-three studies of state-wide problems have been made, in which every county has been compared with every other county in important details of economic, social and civic life and the counties ranked accordingly. These studies have been immensely stimulating to the people of the state. They enable thoughtful citizens to know whether or not their home counties rank high or low and whether or not they are lagging behind, marking time or moving forward in important matters of community building. Eighteen of these studies have appeared in the *University News Letter* and have been reproduced in hundreds of the dailies and weeklies of North Carolina.

In addition forty-three studies of nation-wide problems—economic, social and civic—have been prepared, summaries of which have been given to the public through the *University News Letter*. In these studies each state is ranked with every other, and the tables show at a glance exactly which states are leading and which are lagging in fundamental matters of commonwealth building. These studies have been widely copied in the papers and journals of the United States during the last eleven years. A detailed list of the department investigations during 1923-24 appears on the following pages.

The department has been preparing for some time to put three field research fellows at work in County Courthouse Studies in typical rural counties of North Carolina. The field investigations run through the next three years. The final aim of these studies is to recommend to the state legislature on a fact basis a plan for Improved County Government. It is a matter of fundamental importance in this and other states. These fellowships are awarded to graduate students with M. A. degrees, and lead into doctorate degrees.

During the absence of E. C. Branson abroad the studies of this department have been directed by S. H. Hobbs, Jr.

A list of research studies prepared under the direction of the Department of Rural Social Economics during the college year 1923-24 follows:

## COUNTY STUDIES

The following county bulletins, comprising ten to twelve chapters each, have been published during the year, and three thousand copies of each study have been distributed.

Buncombe County: Economic and Social, by A. M. Moser, Swannanoa, F. J. Herron, Biltmore, J. C. Cheesborough, P. S. Randolph, and I. E. Monk, Asheville.

Forsyth County: Economic and Social, by C. N. Siewers, Winston-Salem.

Randolph County: Economic and Social, by Fred Burgess, Ramseur.

Copies of the above bulletins will be sent free upon request.

So far twelve county bulletins have been printed in editions of three thousand copies each. Several other county bulletins have been prepared by students for their home counties but

these remain unpublished because the students have not been able to secure financial support from the people of the home county. A few of the county bulletins now ready or almost ready for publication are: Alamance, Guilford, Henderson, Rowan, Surry, Vance and Wilson.

Other county studies made last year are in manuscript as follows:

Anson County: Brief History, Edna Garlick, Vance County.

Cabarrus County: Historical Background, and Natural Resources, R. R. Isenhour, Concord.

Chatham County: Farm Conditions and Practices, A. H. London, Pittsboro.

Cleveland County: Facts about the Folks, and Farm Conditions and Practices, W. J. Lackey, Fallston.

Craven County: Wealth and Taxation, Facts about the Folks, and Farm Conditions and Practices, D. L. Ward, Jr., New Bern.

Greene County: Brief History, and Facts about the Folks, J. C. Stanton, Stantonsburg; Farm Conditions and Practices, R. P. Warren, Snow Hill.

Haywood County: Brief History, L. T. Messer, Crabtree.

Harnett County: Wealth and Taxation, Facts about the Folks, and Farm Conditions and Practices, C. C. Rowland, Dunn.

Hyde County: Brief History, and Natural Resources, Z. T. Fortesque, Scranton; Wealth and Taxation, and Farm Conditions and Practices, J. E. Mann, Middletown.

Mitchell County: Brief History, and Natural Resources, Mrs. J. W. Deyton, Mitchell county.

Rockingham County: Brief History, and Natural Resources, H. E. Grubbs, Walkertown; Industries, and Facts about the Folks, W. W. Gwynn, Leaksville; Wealth and Taxation, C. H. Neal, Reidsville.

Rowan County: Brief History, Industries, Wealth and Taxation, and Farm Conditions and Practices, W. H. Woodson, Jr., Salisbury; Facts about the Folks, and Natural Resources, W. T. Shuford, Spencer; The Schools of Rowan, The Local Market Problem, Things to Be Proud of in Rowan, and Our Problems and Their Solution, J. T. Gregory, Salisbury.

Rutherford County: Facts about the Folks, and Farm Conditions and Practices, R. S. Eaves, Rutherfordton.

Scotland County: Brief History, Natural Resources and Industries, and Farm Conditions and Practices, W. F. Lovin, Gibson; Facts about the Folks, J. L. McColman, Gibson.

Stanly County: Brief History, T. H. Biles, Stanly county.

Wilson County: The Local Market Problem, Things to be Proud of in Wilson County, and Problems to be Solved, T. H. Woodard, Wilson.

Yancey County: Brief History, Natural Resources, and Facts about the Folks, L. G. Deyton, Green Mountain.

STATE STUDIES

The Cotton Mill Industry in North Carolina: History of Development, and the Status of Operatives.—Mrs. A. B. Ensminger, Star, N. C.

The Cotton Mill Industry of North Carolina.—D. L. Ward, New Bern.

The Knitting Mill Industry of North Carolina.—R. G. Little, Greenville.

The Furniture Industry of North Carolina.—E. C. Gregory, Salisbury.

Brief History of the Production and Manufacture of Tobacco in North Carolina.—R. C. Carmichael, Durham.

An Analysis of North Carolina as a Factory State.—D. E. Overman, Stantonsburg.

Cost of Schools per Child in Daily Attendance 1921-22.—R. S. Eaves. Rutherfordton.

School Expenditures per Inhabitant 1921-22.—F. O. Yates, Monroe.

School Expenditures per Pupil Enrolled 1921-22.—F. O. Yates, Monroe.

Percent of Negro School Population Enrolled 1921-22.—F. O. Yates, Monroe.

School Attendance of Negroes 1921-22.—F. O. Yates, Monroe.

School Expenditures: Total and for Rural Schools 1921-22.—J. H. Zollicoffer, Henderson.

School Fund: Total and for Rural Schools 1921-22.—J. H. Zollicoffer, Henderson.

School Attendance on Enrollment 1921-22.—J. H. Zollicoffer, Henderson.

School Costs per Rural Child Enrolled 1921-22.—Allan Stainback. Greensboro.

Average Annual Salary Paid Negro Teachers 1921-22.—W. H. Holderness, Tarboro.

Percent of White School Population Enrolled 1921-22—W. H. Holderness, Tarboro.

Percent of White School Population in Daily Attendance 1921-22.—W. H. Holderness, Tarboro.

Average Length of White School Term 1921-22.—R. O. Moye, Greenville.

Average Length of White Rural School Term.—R. O. Moye, Greenville.

School Expenditures per Urban Child Enrolled 1921-22.—R. O. Moye, Greenville.

School Expenditures per Rural Child Enrolled 1921-22.—R. O. Moye, Greenville.

School Expenditures per Child Enrolled 1921-22—R. O. Moye, Greenville.

School Expenditures per $1,000 Taxable Property 1921-22.—E. C. Gregory, Salisbury.

School Costs per Child Enrolled 1921-22.—Allan Stainback, Greensboro.

School Costs per Urban Child Enrolled 1921-22.—Allan Stainback, Greensboro.

The Average Value of School Property per School 1922.—C. L. Reid, Rutherfordton.

Investment per Inhabitant in School Property 1922—C. L. Reid, Rutherfordton.

The Tax Burden per Inhabitant for All County Purposes 1922.—E. B. Smith, Asheville.

The School Tax Burden per Inhabitant 1922.—E. B. Smith, Asheville.

County Tax Rates in 1921.—E. C. Gregory, Salisbury.

State Income Tax by Counties 1922.—E. C. Gregory, Salisbury.

Taxable Wealth in North Carolina 1922.—E. C. Gregory, Salisbury.

Taxable Wealth per White Inhabitant 1923.—A. J. Eley, Woodland.

Taxable Wealth per Negro Inhabitant 1923.—A. J. Eley, Woodland.

Tax Rate by Counties 1923.—A. J. Eley, Woodland.

Bank Capital per Inhabitant 1922.—J. L. McColman, Gibson.

Bank Savings per Inhabitant 1922.—D. E. Overman, Stantonsburg.

Bank Resources per Inhabitant 1922.—J. E. Raper, Linwood.

Bank Resources per Inhabitant 1923.—A. G. Glenn, Boone.

Bank Capital per Inhabitant 1923.—A. K. King, Hendersonville.

Bank Savings per Inhabitant 1923.—A. K. King, Hendersonville.

Bank Capital per Inhabitant 1923.—J. B. Strowd, Greensboro.

Bank Savings per Inhabitant 1923.—J. B. Strowd, Greensboro.

The Distribution of Population, and Population Gains.—E. B. Smith, Asheville.

Farms in North Carolina 1920.—E. B. Smith, Asheville.

County Government and Proposed Changes.—T. G. Henderson, Greensboro.

County Government and Proposed Changes.—S. B. Midyette, Jackson.

Percent of Land Area under Cultivation 1920.—R. C. Carmichael, Durham.

Municipal Government in North Carolina.—T. G. Henderson, Greensboro. and S. B. Midyette. Jackson.

The Carolina Highlands: Her Natural Resources and Her People.—S. W. Brown, Asheville.

Forest Resources of the North Carolina Highlands and Their Conservation.—C. L. Fouts, Franklin.

The Business End of County Government.—J. E. Griffin, Williamston.

The MacRae Colonists: Economic and Social Significance.—R. D. Darden, Wilmington.

County Government in North Carolina.—P. R. Wager, Chapel Hill.

Birth Rate per 1,000 Inhabitants 1921.—J. M. Redwine, Monroe.

Death Rate per 1,000 Inhabitants 1921.—J. M. Redwine, Monroe.

Births per 100 Deaths 1921.—J. M. Redwine, Monroe.

Infant Deaths per 1,000 Births 1921.—J. M. Redwine, Monroe.

White Birth Rate per 1,000 Inhabitants 1921.—T. P. Cheesborough, Asheville.

White Death Rate per 1,000 Inhabitants 1921.—T. P. Cheesborough, Asheville.

Infant Mortality Rates, White, 1921.—T. P. Cheesborough, Asheville.

Infant Mortality Rates, Negro, 1921.—T. P. Cheesborough, Asheville.

## N. C. STUDIES IN PRINT

Income Tax Returns per 1,000 Inhabitants 1921.—W. F. Lovin, Gibson, *News Letter,* Vol. 9, No. 44.

Bank Resources per Inhabitant 1922.—P. Cocke, Jr., Asheville, *News Letter,* Vol. 9, No. 46.

The State's Balance Sheet, Dec. 31, 1922.—*News Letter,* Vol. 9, No. 47.

Food Animals and Population 1870-1922.—Miss H. R. Smedes, Department of Rural Social Economics, *News Letter,* Vol. 10, No. 4.

School Expenditures per Inhabitant 1921-22.—J. H. Zollicoffer, Henderson, *News Letter,* Vol. 10, No. 6.

Average Annual Salaries Paid White Teachers 1921-22.—W. H. Holderness, Tarboro, *News Letter,* Vol. 10, No. 9.

Local School Tax Districts 1922.—F. O. Yates, Monroe, *News Letter,* Vol. 10, No. 10.

Motor Cars in N. C. 1924.—W. S. Tyson, Greenville, *News Letter,* Vol. 10, No. 19.

School Expenditures per Year per Child in Average Daily Attendance 1921-22. *News Letter,* Vol. 10, No. 23.

Investment in Motor Cars per Inhabitant June 1918 and January 1924. —C. L. Reid, Rutherfordton.—*News Letter,* Vol. 10, No. 28.

Value of Factory Products by Counties 1919, Map.—D. E. Overman, *News Letter,* Vol. 10, No. 36.

The following State studies were prepared by Prof. S. H. Hobbs, Jr., Editor of the *News Letter* in Prof. Branson's absence abroad. The issue in which each study appeared is noted.

Marriage and Divorce Rates in N. C. 1922.—*News Letter,* Vol. 10, No. 5.

College Enrollment per 10,000 White Population in N. C. 1923-24.—*News Letter,* Vol. 10, No. 21.

Taxable Wealth per Inhabitant in N. C. 1923.—*News Letter,* Vol. 10, No. 22.

Bonded Debt per Inhabitant by Counties, County and Total, June 30, 1923.—*News Letter,* Vol. 10, No. 24.

High School Graduates in N. C. per 10,000 White Population 1923.—*News Letter,* Vol. 10, No. 25.

Investment in Public School Property per Inhabitant in N. C. 1923.—*News Letter,* Vol. 10, No. 27.

Taxable Wealth per Inhabitant and Aggregate County Tax Rates in N. C. 1923.—*News Letter,* Vol. 10, No. 29.

## NATIONAL STUDIES

School Expenditures per Pupil in Daily Attendance in the U. S. 1921-22. —J. H. Zollicoffer, Henderson.

High School Graduates per 10,000 White Population in 1922.—J. H. Zollicoffer, Henderson.

Per cent School Attendance on Enrollment by States.—J. H. Zollicoffer, Henderson.

Federal Farm Loan System: Federal Land Bank vs. Joint Stock Land Banks: (1) Per cent of Farms on White Loans Have Been Made, (2) Average Loan per Farm by Each Type of Bank, and Combined, (3) Relative Growth of the Two Types of Farm Loan Banks.—H. A. Lineberger, Belmont, and L. J. Brody, New Haven, Conn.

Birth Rate per 1,000 Inhabitants 1921.—J. M. Redwine, Monroe.

Death Rate per 1,000 Inhabitants 1921.—J. M. Redwine, Monroe.

Births Per 100 Deaths 1921.—J. M. Redwine, Monroe.

White Birth Rate per 1,000 Inhabitants 1921.—T. P. Cheesborough, Asheville.

White Death Rate per 1,000 Inhabitants 1921.—T. P. Cheesborough, Asheville.

Infant Mortality Rates, White.—T. P. Cheesborough, Asheville.

Infant Mortality Rates, Negro.—T. P. Cheesborough, Asheville.

School Expenditures per Day per Child in Daily Attendance 1921-22.—W. S. Tyson, Greenville.

Dairy Cows per Farm in the U. S. 1924.—W. S. Tyson, Greenville.

Inhabitants per Motor Car 1924.—W. S. Tyson, Greenville.

Per Capita Cost of State Governments 1922.—J. H. Zollicoffer, Henderson.

Per Capita Revenue of State Governments 1922.—J. H. Zollicoffer, Henderson.

Increase in the Cost of State Governments, 1914-1922.—J. H. Zollicoffer, Henderson.

Taxable Wealth per Inhabitant 1923.—J. H. Zollicoffer, Henderson.

The Sources of State Revenues 1922.—J. H. Zollicoffer, Henderson.

True Wealth per Inhabitant in the U. S. 1922.—F. O. Yates, Monroe.

Increase in True Wealth per Inhabitant, 1900-1922.—F. O. Yates, Monroe.

Value of Farm Crops by States 1923.—F. O. Yates, Monroe.

Bank Resources in the U. S. 1923.—F. J. Wolfe, New Mexico.

Postal Savings in the U. S. 1923.—F. J. Wolfe, New Mexico.

Value of Farm Products by States 1923.—W. B. Hooks, Goldsboro.

Value of Farm Crops per Farm 1923.—W. B. Hooks, Goldsboro.

Value of Farm Products per Farm 1923.—W. B. Hooks, Goldsboro.

## U. S. STUDIES IN PRINT

The following U. S. studies have been published in the issues of the University *News Letter* as noted. These special studies were prepared by Prof. S. H. Hobbs, Jr., Acting Editor of the University News Letter in Prof. Branson's absence abroad.

Changes in Farm Occupancy in the U. S. 1922.—*News Letter,* Vol. 9, No. 42.

Born in North Carolina but Living in Other States in 1920.—*News Letter*, Vol. 9, No. 50.

Ratio of Divorces to Marriages, 1922.—*News Letter*, Vol. 10, No. 3.

Federal Farm Loans to June 30, 1923.—*News Letter*, Vol. 10, No. 7.

The Cost of State Governments per Inhabitant 1922.—*News Letter*, Vol. 10, No. 11.

Tax Burden per Inhabitant for All Purposes Within Each State 1922.—*News Letter*, Vol. 10, No. 12.

Bonded Dept per Inhabitant for All Purposes, State, County, Town, and Local Districts 1922.—*News Letter*, Vol. 10, No. 13.

Property Tax Rates in the U. S. for All Purposes in 1922.—*News Letter*, Vol. 10, No. 14.

School Expenditures per Inhabitant in the U. S. 1921-22.—*News Letter*, Vol. 10, No. 16.

Average Salaries paid White Teachers in the U. S. 1921-22.—*News Letter*, Vol. 10, No. 17.

The Cost of Public Education per Pupil Enrolled by States 1921-22.—*News Letter*, Vol. 10, No. 18.

Wealth Increase in the U. S. 1912-22.—*News Letter*, Vol. 10, No. 20.

State Health Expenditures in the U. S. 1923.—*News Letter*, Vol. 10, No. 26.

Inhabitants per Motor Car in U. S. 1923 and Percent Increase during 1923.—*News Letter*, Vol. 10, No. 30.

Birth and Infant Death Dates in U. S. 1923.—*News Letter*, Vol. 10, No. 34.

## N. C. CLUB STUDIES

The North Carolina Club at the University was established in November 1914. The Club is composed of students and faculty members who are interested in studying their home state. Once every two weeks for one hour the Club meets to hear a paper on some subject which concerns the economic, social, or civic life of the state. At the end of the year the papers are published in the Club Year-Book. Papers on the following subjects were presented before the Club during the college year:

October 22.—County and County Group Hospitals. W. L. Smith, Guilford County.

November 5.—Forest Conservation in North Carolina. W. E. White, Cleveland County.

November 19.—County Prisons in North Carolina. W. B. Sanders, Orange County.

December 3.—State Prison Reform in North arolina. N. B. Brunson, Pitt County.

December 17.—County Government in North Carolina. T. G. Henderson, Guilford County.

January 21.—County Boards of Public Welfare. Miss Katherine Wilson, Moore County.

February 4.—Home and Farm Ownership. W. E. White, Cleveland County.

February 18.—State Program of Physical Education. J. F. White, Granville County.

March 3.—County and County Group Homes for the Poor. Miss Lucy Lay, Carteret County.

March 17.—Attractive Rural Homes for North Carolina. R. S. Pickens, Stanly County.

March 31.—County-Wide Library Service. E. D. Apple, Rockingham County.

April 14.—State Program for Delinquent Girls. Miss Norma Connell, Warren County.

April 28.—Country Community Life and Coöperative Farm Enterprise. F. S. Griffin, Rockingham County.

May 12.—The Equalizing of Taxes. W. C. Perdue, Vance County.

May 26.—A State-Wide System of Public Schools. M. A. James, Madison County.

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## DEPARTMENT OF SOCIOLOGY

The second volume of *The Journal of Social Forces* will have been completed with the September number. In these numbers more than one hundred and forty articles have appeared from the workshops of men in the following colleges and universities: Columbia, Harvard, Yale, Kansas, Alabama, California, Southern California, North Carolina, Chicago, Goucher, Minnesota, Iowa, Western Reserve, Brown, Northwestern, Fiske, Wisconsin, North Dakota, Dartmouth, North Carolina College for Women, Baylor, Teachers College, Michigan, Barnard, Wake Forest, Swarthmore, Cornell, Berea, North Carolina State, Haverford, Tulane, Smith, Washington, Wellesley, Tuskegee, Florida, Missouri, West Virginia, Mississippi, Texas, Miami, Mercer, Virginia, Butler, Elon. In addition to these articles from the universities, there have been an equal number of contributions from specialists and social workers dealing with public welfare and social work, the church and religion, inter-racial co-operation, county and country life, town and city programs, work of women's organizations.

Howard W. Odum is continuing his study of Public Welfare in the United States, The Study of Social Problems, Leadership in the South. He has contributed the following:

Dependable Theory and Social Change, *Journal of Social Forces,* January, 1924.

Modern Equivalents for Pioneering Forces, *Journal of Social Forces,* November, 1923.

Public Welfare and Country Life, *Proceedings of the American Country Life Association,* 1924.

The City Manager and Public Welfare, *Proceedings of the City Managers' Association,* 1924.

The Scientific Journal and Social Interpretation, *Proceedings of the National Conference for Social Work,* 1923-24.

Jesse F. Steiner is continuing his studies of Community Organization, which is to be published shortly by the Century Company.

He is making special researches into the problems of Community Disorganization and the co-ordination of social work in cities of North Carolina and the South.

He has contributed the following to *The Journal of Social Forces.*

Community Disorganization, January, 1924.

Field Work, Training and Community Organization, March, 1924.

Harold D. Meyer has published the following:

The Correlation of Play with School Studies, University Bulletin, 1924.

Community Values in Recreation, *The Nation's Health,* April, 1924.

He is continuing his study of Institutional Recreation in North Carolina.

Wiley B. Sanders has made special studies of Juvenile Courts and of Prison Population in North Carolina. He has contributed the following:

Training of Rural Leadership: The North Carolina Plan, *Journal of Social Forces,* November, 1923.

GEORGE H. LAWRENCE is making the following studies:

A Study of the First One Hundred Cases of Mothers' Aid in North Carolina.

A Study of Outdoor Poor Relief in Chatham County.

The Rochell Family: A Study in Feeble-Mindedness.

A Ten Year Study of the Boys of Jackson Training School.

GUY B. JOHNSON is doing comprehensive research in Southern race problems.

ROY E. BROWN is making special studies in the municipal and social problems in the small towns of North Carolina.

The following Master's theses were presented in June, 1924:

GEORGE WEAVER MANN. Institutional Factors in Social Change.

It is generally conceded that one of the most vital inquiries that can be made today is the study of fundamental groups and especially of the major social institutions. There is no more difficult task than that of ascertaining the status of the great traditional institutions of society and of finding out what adaptations they must make in function and structure if they are to meet the tests of social change. There is a growing concensus of opinion that the institutions are responsible for the majority of individual and group failures and that the emphasis of modern research ought now to turn toward inquiries into human adequacy. This thesis presents some comparative data showing some of the relational responsibility of the home and family, the school and education, the church and religion, the state and government, industry and work, community and association, in the normal growth and development or in the abnormal failure of the individual. It attempts further to measure the average individual in relation to the institutions and to see whether such measuring scales are effective, first in ascertaining actual conditions, and second, in testing out certain measuring scales. The majority of the data, however, gathered from the twenty-five hundred individuals estimated cannot be utilized adequately until other studies of individual differences, together with geographic and other environmental influences, are studied.

JOANNE FARRELL STURDIVANT. The Status of the Small Mill Village.

One of the most important problems now facing the South is the problem of the small mill village and its status in the rapid changes due to the industrial revolution brought about by the great Southern textile industry. On few subjects are there less concrete and objectively measured data. The present inquiry attempts to gather all available information concerning Carrboro, North Carolina, a mill village of less than twelve hundred popula-

tion, closely related to its surrounding rural territory and to its own village commercial life. The results indicate that the population of Carrboro is rather stable, industrious, and still closely interrelated to the farm populations from which they came. Carrboro does not conform to many of the characteristics commonly ascribed to the pure mill village and the next important step is to find out what proportion of the small mill villages in the South are similar to Carrboro. In its present processive evolution the social population of Carrboro offers a particularly timely opportunity to study the stages of industrial evolution and to work out programs for maintaining the well balanced social and industrial life of mill villages. This study is the first of a long series of concrete research, and as such offers a good beginning.

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## INSTITUTE FOR RESEARCH IN THE SOCIAL SCIENCES

Beginning in the fall of 1924, the University of North Carolina is inaugurating an Institute for Research in the Social Sciences with a special organization and with provisions for research assistants, secretarial help, field expenses, and library facilities adequate to undertake exhaustive research into special problems approved by the Directors. There will be available at least eight research assistantships, paying $1500.00 each, with such field expenses, clerical assistance, and books as may be approved for each special study. These appointments are made for one year but may be renewed for a longer period when the nature of the work and the ability of the candidate justify. The prerequisite of such a candidate has been fixed, the minimum being a master's degree or the equivalent of one full year of graduate research training and experience. The subjects for research will be chosen in the field of social sciences, ignoring departmental lines, and working toward a larger correlation of both departments and subjects. This Institute has been made possible by a three year grant by The Laura Spelman Rockefeller Memorial Foundation.

Full details concerning the appointments may be had by inquiring at the office of the President of the University who is Chairman of the Board of Directors of the Institute.

## DEPARTMENT OF ZOOLOGY

H. V. WILSON. Amoeboid Behavior of the Lymph Cells in Sea Urchins. A paper before the Elisha Mitchell Scientific Society, December 11, 1923 and before the North Carolina Academy of Science, May 2, 1924. *Journal of the Elisha Mitchell Scientific Society,* in press.

The paper briefly describes the several types of cells found in the coelomic fluid of *Arbacia punctulata* together with the shapes and movements of the various kinds of pseudopods to be seen round the edges of the plasmodial masses which are produced by the fusion of the amoebocytes.

H. V. WILSON. Extra-collegiate Intellectual Service. A Report for the Committee on Methods of Increasing the Intellectual Interest and Raising the Intellectual Standards of Undergraduates. *Bulletin of the American Association of University Professors,* Vol. X, No. 5, May, 1924.

Summaries of earlier discussions covering opinion and practice in various institutions are given, together with a bibliography. It is shown that extra-collegiate service must be interpreted to include non-teaching work of many kinds. While in some cases teaching duties are discharged with such faithfulness and artistic completeness that they absorb the whole energy of the university teacher, extra-collegiate service is in general vital to the health of a university. Much of this work will fall under the head of research, some under that of professional practice or expert service. How to keep it all at a high level is a problem which hard and fast rules do not solve. A satisfactory solution depends largely on the development of a set of institutional habits, on the creation of a university atmosphere. Some suggestions, necessarily vague in the present phase of our intellectual development, are made toward the realization of this idea.

R. E. COKER was director of biological investigations relating to fisheries problems for the United States Bureau of Fisheries at Wood's Hole, Mass., during the summer of 1923; a report of the progress and results of investigations will appear in an early number of *Science.* He completed a paper on hydrogen-ion concentration in relation to the distribution of trout with special reference to observations in certain waters of western North Carolina and of Cape Cod, Mass. A study of the copepods and cladocerans of Lake James, in Burke and MacDowell counties, N. C., is in progress.

W. R. EARLE. Injection of the Blood Vessels of Young Chick Embryos. Before the North Carolina Academy of Science, May 3, 1924. *Journal of the Elisha Mitchell Scientific Society,* in press.

Apparatus and a method for the injection of the blood vessels of young chick embryos with india ink are described.

The following Master's Theses were accepted during the year by the Department.

WILTON R. EARLE. Development of the Eye in the Salamander Amblystoma Punctatum.

The structure and histogenesis of the visual epithelium of Amblystoma punctatum are discussed from the point of view of whether the rods and the cones composing this visual epithelium develop simultaneously, or whether, in accord with the views of Bernard and Cameron, the development of the cones precedes that of the rods, the cones being developmental stages in the formation of rods.

The outline of the structure and development of these cells as given in this paper follows very closely that of previous accounts.

NAN MAY SMITH. The Behavior of the Embryonic Cells of the Sea-Urchin (Arbacia) in Lymph Plasmodia outside and inside the Sea-Urchin's Body.

The ameboid behavior of Echinoderm lymphocytes and syncytia in "clotting" has been studied in the past by a number of investigators. It was found that the perivisceral fluid of these animals contained colorless corpuscles, or amoebocytes, having long pseudopodia. When this fluid was taken from the body of the animal it "clotted." This "clot" was found to be a pseudo-coagulation rather than a true clot since it contained no fibrin but was formed by the fusion of the amoebocytes present in the blood. The amoebocytes by their fusion were found to form a reticular syncytium in which the other cellular elements of the blood became embedded.

Detailed study of clot masses of varying ages shows in these masses the fusion of thread like pseudopodia to form long heavy strands which give the mass a fibrous appearance. Sections of old plasmodia show that the tissue is not of uniform consistency throughout. The reticular syncytium in some places is very delicate and contains only widely scattered nuclei while in other places the nuclei are closely packed and the protoplasm is very dense. The smooth surface on the outside of spheroidal plasmodia is seen to be composed of a delicately reticulate syncytium.

Cuénot and other investigators made studies concerning the differentiation of clot masses into tissue as part of wound membranes. It was found that when wounds were made in the tests of an urchin, amoebocytes united to form a plasmodium which filled up the gap.

Wilson studied the behavior of sea-urchin embryos when included in lymph plasmodia and in wound membranes. He found that the embryos continued to develop for a time and then their cells became dissociated. Some of the cells degenerated and some of them became connected with each other and with the lymph plasmodium, the latter in this way becoming temporarily at least a part of the regenerative tissue.

Studies made of plasmodia in which blastulae have been incorporated, preserved at different ages, show that the eggs develop. Encorporated as blastulae with a segmentation cavity, they become stereoblastulae by delamination of the outer cells to form cells which fill up the central cavity. Some of these embryos in all stages break up. Those in which development does not go on break up and the cells degenerate. When development proceeds to the stereoblastula stage and dissociation then takes place, many of the cells unite to form a syncytium continuous with the lymph syncytium. The embryonic cells, because of the fact that through division their nuclei become smaller, approach the lymph cells in appearance. Embryonic cells in plasmodia grafted on wound membranes behave in the same way.

Plasmodia in which eggs have just been incorporated appear in general structure like pure lymph plasmodia. In older egg plasmodia the protoplasm takes a much deeper stain and is more coarsely alueolar than that of young egg plasmodia and pure lymph plasmodia, due to the fact that the lymphocytes have engulfed degenerating embryonic tissue.

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## THE ELISHA MITCHELL SCIENTIFIC SOCIETY

The Elisha Mitchell Scientific Society, composed of faculty and advanced students from the scientific departments of the University and members of the Geological Survey, numbered for the year 1923-1924 150 members (64 active and 86 associate). The officers of the Society were: *President,* A. S. Wheeler; *Vice-President,* R. E. Coker; *Permanent Secretary,* J. M. Bell; *Recording Secretary and Treasurer,* H. R. Totten; *Editors of the Journal of the Elisha Mitchell Scientific Society,* W. C. Coker, J. M. Bell and Collier Cobb. Fifteen papers were presented at the eight meetings held during the year, of these fourteen were presented by members of the University faculty and one by a visiting scientist. The complete programs and abstracts of most of the papers not appearing elsewhere in this bulletin are given below.

## Programs of the Elisha Mitchell Scientific Society, during 1923-1924.

### 266th Meeting, October 9, 1923.

F. P. VENABLE. Historical Sketch of The Elisha Mitchell Scientific Society.

Dr. F. P. Venable, the first president of the Society, described the organization of the Society in 1883; gave the reasons for forming this, probably the first society of its kind in any of the southern universities; explained why it was named for Elisha Mitchell; and gave interesting sketches of the youthful, enthusiastic founders—J. A. Holmes, R. H. Graves, W. B. Phillips and F. P. Venable. The Elisha Mitchell Scientific Society fostered a spirit of research that through the forty years has produced results. *The Journal of the Elisha Mitchell Scientific Society*, now in its thirty-ninth year, has published over six thousand pages and is one of the recognized scientific publications both in this country and abroad. (This paper appears in full in *The Journal of the Elisha Mitchell Scientific Society* 39: 117-122. 1924).

W. C. GEORGE. Some Peculiar Amoeboid Cells in Perophora. (See page 5).

### 267th Meeting, November 13, 1923.

PAUL H. DIKE. Magnetic Surveys by the Carnegie Institution (Illustrated).

A brief historical sketch of earlier magnetic surveys was followed by a description of the magnetic work undertaken by the Carnegie Institution. Large portions of the earth's surface had never been surveyed, and it was necessary before theories as to the causes of the magnetic field of the earth could be put to the test, to undertake extensive surveys both on land and on sea.

The methods of carrying out a land survey were outlined and representative views shown, to give an idea of some of the difficulties encountered by the observers. The work of the Galilee and of the Carnegie, the two Magnetic Survey yachts that have been used by the Department, was described. A chart was shown representing the cruises of the yachts and the land expeditions undertaken, showing the extent of the work done up to the present.

The object and methods of the magnetic observatories were discussed, typical records shown, and pictures of some of the observatories presented. Some of the associated problems, Atmospheric Electricity, Earth Currents, Solar Disturbances, etc. were briefly mentioned, and their importance in the formulation of a theory to account for the Earth's magnetic field and its fluctuation pointed out.

FRANK C. VILBRANDT. By-producting North Carolina Coals.

A review of the history and location of the Deep River Coal Fields of Chatham and Moore counties was given. Production, labor and transportation difficulties were also discussed. A brief study of the effects of temperature on the coal from the Farmville Mine of the Carolina Coal Company was presented, setting forth the following conclusions from the results obtained:

1. The high volatile coal can be reduced to very high grade metallurgical coke and also coke of any desired volatility for domestic consumption by proper temperature control during by-production.

2. The temperatures of the primary and secondary reactions in the by-producting of this coal are lower than ordinary bituminous coals.

3. The tar distillates and gas evolution tests can be used as criteria in the study of by-producting reactions.

4. That the B.t.u. of the by-product coals at various temperatures does not materially decrease on increased heat treatment.

## 268th Meeting, December 11, 1923.

H. V. WILSON. Amoeboid Behavior of the Lymph Cells in Sea-Urchin. (See page 92).

W. DEB. MACNIDER. The Effect of Changing the Chemical Constitution of the Blood on Kidney Functions and Pathology (Illustrated).

In the animal organism there are constantly being produced, as a result of destructive metabolic processes, bodies of an acid character. One of the main functions of the kidney is to eliminate such bodies and maintain a normal acid-base balance of the blood and tissue juices. If this balance is not maintained the kidneys as well as other organs are given a blood of such changed chemical constitution that their function becomes impaired as a result of degenerative changes developing in the specialized cells.

This type of kidney injury can be experimentally induced in the dog by injecting intravenously either a N/2 solution of Hydrochloric Acid or a solution of Sodium Carbonate equimolecular with a 3% solution of Sodium Chloride. When the acid-base equilibrium of the blood is so altered either by the introduction of hydrogen or hydroxyl ions as to furnish the kidney an altered physico-chemical environment in terms of its blood supply the renal epithelium becomes edematous and necrotic and renal function is decreased or suppressed.

269th Meeting, January 8, 1924.

COLLIER COBB. Earthquakes, with Special Reference to the Japanese Earthquake of September 1, 1923. (Illustrated).

The paper covered briefly investigation of earthquake areas from Guatemala to Alaska and from the Aleutian Islands through Japan, made in 1920-'21, showing photographs of the faults. In every single line examined, and in all the recent photographs furnished by Japanese friends the fault was a thrust-fault, and these frequently occurred along stream-beds and roadways, where erosion or man's work had produced a slight line-of-weakness.

J. N. COUCH. A Dioecious Water Mold (*Dictyuchus monosporus*).

270th Meeting, February 12, 1924.

A. W. HOBBS. The Breaking Strength of Concrete Cylinders as a Function of their Height.

The practical work of engineering and of all science is very much simplified if the relations which are known to exist between the quantities considered can be expressed in exact mathematical form, that is, as mathematical functions. While the great laws of the universe have been worked out, often from theoretical considerations, and expressed in fairly simple mathematical form, the relations between the quantities that we deal with here on our particular spot of earth do not as a rule lend themselves very well to theory. The best we can do is to discover a curve, when we know from the data a certain number of its points, a point being represented by a pair of values found by experiment, of the two quantities the form of whose relationship we are trying to establish.

In the study of mathematics we learn the equations of a great many curves, so that when we see a curve, we have a pretty good idea of the form of its equation. Having drawn the curve of our data, we proceed to guess at an equation which will represent it and then see if by changing the coefficients we can make the actual curve fit the equation. In order to simplify the work we try to find a transformation which will map the given curve into a straight line.

The heights of the cylinders used with their corresponding breaking strengths were as follows:

| *Height* | *Breaking Strength* |
|---|---|
| 6 inches | 3618 |
| 7 " | 3345 |
| 8 " | 3133 |
| 9 " | 3140 |
| 10 " | 3091 |

11 " ..... 3053
12 " ..... 3109
13 " ..... 2900

When this data is plotted, the curve is of the hyperbolic type. We thus assume its equation to be of the form:

$$p = \frac{h}{a + bh} .$$

This equation can be written,

$$\frac{a}{h} + b = \frac{1}{p} ,$$

Which is a linear equation in $\frac{1}{h}$ and $\frac{1}{p}$.

These values give approximately a straight line when plotted. The values of a and b are found to be

$$a = -.000625 \qquad b = .000385$$

The function, then, that states the relationship of breaking strength to the height of the cylinders is:

$$p = \frac{10000h}{-6.25 + 3.85h}$$

## J. F. DASHIELL. Race Differences in Temperament.

The Downey Individual Will-Temperament Test was applied to the measurement of high school and college students of the negro and white races (about forty individuals in each of the four groups). This test is based upon the handwriting reaction as a convenient motor response involving many of the general factors of voluntary activity such as speed, flexibility, inhibition, coördination, perseverance, etc. In general it was found in this survey that the white group contained a much higher percentage than did the negro groups of individuals of the controlled, deliberate, careful type; a somewhat higher percentage of those of the mobile, rapid-fire type; and a smaller percentage of those of the aggressive type. The last named fact calls for interpretation probably in terms of compensation by the negro—his submissiveness in general relations with the whites being compensated for by an exaggerated expansiveness when given free opportunity in the test. One qualifying factor of the study not to be neglected is that the negro students tested represented a much higher and narrower selection from their race than did the white students.

271st Meeting, March 11, 1924.

J. M. BELL. The New Chemical Laboratory.

H. F. JANDA. Capillary Moisture in Highway Sub-grades.

At the suggestion of Mr. Charles M. Upham, State Highway Engineer of North Carolina, the School of Engineering undertook a series of experiments on capillary moisture in highway subgrades. The Highway Commission employed Mr. Roy J. Morton, a graduate student in engineering as a Research Fellow in Civil Engineering and paid for all construction and labor. The School of Engineering supervised and assisted in the design of apparatus.

The first problem was to determine whether or not drain tile would remove capillary moisture. Several soils were tried and the following conclusions reached: (1) That drain tile are of no direct value in removing, or preventing the rise of, purely capillary moisture. (2) That the percentage of capillary moisture is reduced as the elevation of the subgrade above the water table is increased. Therefore, tile drain might reduce the percentage of capillary moisture by lowering the water table. (3) That the percentage of capillary moisture may be reduced by evaporation in connection with horizontal capillary movement, or by a reverse process it might be increased. Therefore, good drainage at the edge of a hard surfaced road will assist in preventing capillary moisture under the pavement itself.

Since drain tile were found not to be effective in removing capillary moisture, a method of preventing the rise of such moisture was next investigated. The object of this series of tests was to establish conclusions as to the value of coarse layers (non-capillary) in preventing capillary action, and so far as possible, determine what non-capillary materials would be the most suitable for this purpose. The following conclusions were reached: (1) That a layer of coarse, non-capillary material is an effective agent in preventing the rise of capillary moisture. (2) That some materials are more effective than others. (3) That sand seems to be the most effective agent in preventing capillary action. This is probably due to the fact that the particles are large enough to prevent capillary action, while the interstices are not sufficiently large to allow fine capillary material to enter and act as a wick to the moisture through the layer.

272nd Meeting, April 12, 1924.

STUART J. LLOYD, of the University of Alabama. Muscle Shoals and Nitrogen Fixation.

The key to cheap fixed nitrogen for fertilizer purposes lies in cheap hydrogen. Research work carried on by the Alabama Power Company has resulted in the incidental production of hydrogen (as a by-product) in three cases:

1. *Calcium arsenate,* the only reliable boll weevil remedy has hitherto been produced by the action of nitric acid upon white arsenic, to oxidize it to arsenic acid, and the subsequent precipitation of this arsenic acid with lime. By dissolving white arsenic in caustic soda, and electrolyzing between iron electrodes, the oxidization to sodium arsenate is accomplished, and large quantities of by-product hydrogen are simultaneously produced.

2. *The Estelle process* for electrolytic iron consists in the electrolysis of a *hot, very concentrated,* solution of caustic soda, in which is suspended finely divided iron hydroxide. Here also considerable hydrogen is produced at the cathodes, as in electrolytic zinc production.

3. *Electromagnetic flotation* is a novel method of coal washing, in which a strong magnetic field is used to vary at will the apparent specific gravity of the solution used, which carries a current, and produces inevitably a considerable quantity of by-product hydrogen.

## 273rd Meeting, May 13, 1924.

### A. S. WHEELER. New Dyes from Spruce Turpentine.

Spruce turpentine obtained as a by-product of the big paper mill at Canton, N. C. was used by A. S. Wheeler and H. M. Taylor in their researches to yield a series of very beautiful dyes in yellow, pink, red, maroon, and brown tones. Scientifically the process is as follows:

When 2-amino-p-cymene is brominated in the cold analysis shows that the product contains one bromine atom. This involves a question of orientation. It is definitely settled that in the nitration of p-cymene the nitro group enters position two. When this compound is reduced 2-amino-p-cymene is obtained. It is possible for the bromine atom to enter either the side chain or the ring. Entrance into the side chain is immediately eliminated since the compound obtained has none of the characteristics of the aliphatic halogen compounds and since the bromination was carried out in the cold. Of the positions in the ring which the bromine atom may enter there are three, namely, positions 3, 5, or 6. There are two lines of attack open for the determination of which position it occupies.

First: The brominated amine was diazotized and the amino group replaced by a bromine atom by means of Sandmeyers reaction, forming a dibromocymene. This compound was then oxidized and a compound, identical with the 2,5-dibromo terephthalic acid, was obtained. This compound was further identified by preparing the diethyl ester which is identical with the diethyl ester of 2,5-dibromo terephthalic acid.

Secondly: The brominated amine was acetylated to protect the amino group and then oxidized with neutral potassium permanganate. Analysis for bromine and titration with alkali indicate this compound to be a monobasic acid and furthermore, a cuminic acid. Upon hydrolysis with sodium hydroxide a compound, identical with the 2-amino-5-bromo-cuminic acid, is obtained.

Since the amino group occupies position 2 in the para cymene molecule the bromine atom must enter position 5 and the bromination of 2-amino-p-cymene in the cold is thus shown to give 2-amino-5-bromo-p-cymene.

The following new dyes have been prepared:

2,4(5-bromo-carvacryl disazo)-phenol.
4(5-bromo-carvacrylazo)-resorcinol.
2,6(5-bromo-carvacryl disazo)-thymol.
2,4(5-bromo-carvacryl disazo)-1-naphthol.
1(5-bromo-carvacrylazo)-2-naphthol.
2(5-bromo-carvacrylazo)-1-naphthol-4-sulfonic acid.
4(5-bromo-carvacrylazo)-1-naphthol-2-sulfonic acid.
1(5-bromo-carvacrylazo)-2-naphthol-7-sulfonic acid.
1(5-bromo-carvacrylazo)-2-naphthol-6-sulfonic acid.
1(5-bromo-carvacrylazo)-2-naphthol-3,6-disulfonic acid.
2(5-bromo-carvacrylazo)-1,8-dihydroxy naphthalene-3,6-disulfonic acid.

The above dyes were made by coupling the diazotized 2-amino-5-bromo-p-cymene hydrochloride with molecular equivalents of phenols or naphthol sulfonic acids. Investigation of the physical and chemical characteristics and dyeing properties of the above is now being carried out.

THORNDIKE SAVILLE. Some Power Investigations on Deep River (Illustrated).

A complete power study of Deep River was presented, based on field work comprising a river profile and traverse, cross sections of dam sites, storage studies, and estimates of power which may be developed.

The total fall from crest of a proposed 40-foot dam near Jamestown to Moncure is 612 feet in 114 miles. The fall now developed is 302 feet. Of the 310 feet now undeveloped the report indicates how 247 feet may be economically developed, utilizing 90% of the fall of the river.

The stream flow studies indicate very low unit discharge in the fall months. This may be considerably augmented by storage reservoirs. Three such reservoirs with dams 40, 50 and 60 feet high respectively, are recommended. They would serve to increase the low water flow about 300%.

Investigation of silting in existing power ponds indicates that at present plants more than half the available power is lost through inability to store the night flow. Silt removal methods are considered.

The primary and secondary water power which can be developed at existing and recommended developments is discussed. At present 279-feet fall is developed on Deep and Rocky Rivers with 1147 24-hour primary horsepower and 4597 24-hour secondary horsepower theoretically available. If the rivers are fully developed in accordance with the scheme recommended, 604 feet will be utilized, and there can be produced 8160 24-hour primary and 6774 24-hour secondary horsepower.

By use of mouth-of-mine steam auxiliary station at the Deep River Coal Fields, there may be produced 15,000 continuous 24-hour horsepower or 26,500 10-hour horsepower. The steam plants would have to be used only about one-third of the time.

The results outlined can only be obtained economically by interconnection of all water and steam power plants to form a local super-power system. This system must be operated as a unit. A scheme is indicated whereby the various power interests on the river would combine to form a single organization to effect these ends.

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## THE PHILOLOGICAL CLUB

The Philological Club numbered a total of 85 members during the academic year of 1923-1924, an increase of 26 over the previous year. Of the eight meetings held, seven were devoted to papers by members of the University faculty and the other to a paper by a visiting scholar. The complete program, with abstracts of the papers not appearing elsewhere in this bulletin, is given below.

October 3—T. S. GRAVES, "Adventures of Hamlet's Ghost." (See page 39).

November 6—G. A. HARRER, "A Contemporary Account of the Fall of Charles I of England."

The *Elenchus Motuum Nuperorum in Anglia simul ac Iuris Regii et Parlamentarii Brevis Enarratio* was first published in Paris in the year 1649, a few months after the execution of Charles. Its author concealed his identity by the pseudonym *Theodorus Veridicus*, which has been generally assigned to George Bate, physician to Charles I, later to Charles II, and in the interregnum, to Cromwell. The book is written in a good Latin style, which at times reminds one of Tacitus. Its content can be of no great historical value for the facts of history, for it is too brief; but it is of interest for its portrayal of the feelings of an ardent supporter of the King's cause. Selected passages translated show its characteristics.

December 4—OLIVER TOWLES, "Jean Lemaire de Belges in Relation to the Contemporaneous Artistic Movement."

Jean Lemaire was the greatest poet among the so-called Rhetoriqueurs. His interest in art, and its influence on his work, distinguished him particularly from others of his school.

His knowledge of painters, sculptors and goldsmiths appears to be considerable. The influence of art upon his style may be seen in many passages. It is Flemish rather than Italian art that we see reflected in his writings.

January 9—A. H. GILBERT of Trinity College, Durham, N. C., "Some Perennial Devices of Dramatic Structure Illustrated from Othello."

Beginning with a brief summary of the various materials dealing with stage devices from the time of Aristotle up to Shakespeare's period, the author illustrates these dramatic devices, particularly the handkerchief, as they were used by Shakespeare in his tragedy *Othello.* His conclusion is that Shakespeare, though perhaps somewhat unconsciously, was making use of a well known and time-tried dramatic device .

February 12—EDWIN GREENLAW, The Precept *Live According to Nature* in the English Renaissance.

One aspect of the history of thought in the English Renaissance is the history of the precept "Live according to Nature." The paper discussed briefly classical interpretations of the idea, and then presented a series of references in Elizabethan and seventeenth century English literature and philosophy from *Utopia* to the establishment of the scientific renaissance. Special attention was given to Bacon, to the extent of the Epicurean philosophy in England, and to the attacks on this materialistic view of the universe.

March 4—A. A. SHAPIRO, Relation of English to Foreign Modern Languages.

Poor English is accepted as a corollary evil by teachers in their foreign language classes. This paper does not consider whether this need be so, but why it is so, and how the condition exists.

Errors in English in foreign language classes are not committed by students good in other subjects, but by students who are generally poor.

The causes of such poor English are as follows: work done mechanically; incomplete knowledge of the subject; general inability to keep to good English; carelessness; looseness of work; inconsistency or illogicality; confusion of what the student thinks an answer should be with what it actually is; failure of student to realize he is being tested for his knowledge of the subject; some physical defect, as of eye or ear; pernicious influence of some other language; interworking of English and Spanish spelling or grammar; poor English spelling or grammar.

Three main reasons are apparent as giving rise to poor work by students: (1) their endowed talents; (2) their active psychology; (3) school conditions.

Transfer of training has comparatively little effect. If students are generally good, then they are good in language also. Training in one thing simply to develop the mind, so that the student may be good in another thing, is too indirect to bear results commensurate with the effort involved.

Haste of students to finish assignment is a large contributing factor to poor work.

Perhaps the problem, though not resolved, may be lessened by coöperation between English and foreign modern language departments, without, however, either giving up its autonomy. Ultimately, secondary schools must be made more exacting in their requirements upon pupils.

April 1—NORMAN FOERSTER, Emerson's Conception of Organic Art. (See page 38).

May 6—E. C. P. METZENTHIN, The Contributions of Semitic Languages and Literature to the Study of Comparative Philology. (See page 57).

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## SOCIETY OF THE SIGMA XI

The University of North Carolina Chapter of the Society of the Sigma Xi (the Society for the Promotion of Research) was until the present year the only chapter of this Society in the South. That the Chapter was established at the University, is outstanding recognition of the national reputation of the University in the fields of science.

During the past year three general meetings have been held, to which members of the Society resident in other institutions in the state have been invited. At the first meeting Dr. Francis P. Venable delivered a talk upon the development of scientific research at the University, stressing particularly the work done prior to the formation of the Mitchell Scientific Society.

The second meeting was held for the election of officers and new members. One active member from the Faculty, and twelve associate members from graduate students specializing in science, were elected.

The third meeting was held as usual at Commencement time, for the initiation of new members. Dr. Edward J. Wood, of Wilmington, who had been elected to Alumni Membership, spoke

of his researches on the relation between Sprue and Pernicious Anemia, and his investigation to discover the causative organism of these diseases.

The Annual Lectures of the Society were delivered April 14 and 15 by George Chandler Whipple, Professor of Sanitary Engineering at Harvard University.

The first lecture was entitled "A Study of Stream Pollution" and dealt with The Force of Life, The Aggregate Power of Microscopic Organisms, Natural Waters, Sewage Pollution, Aquatic Slums, Decomposition, The Role of Oxygen, Photosynthesis, Bacteria, Protozoa and Crustacea; Fungi, Algae, and Water Weeds; Rhizopods, rotifers, and worms; Biological Balance, Disturbing Effect of Factory Wastes, Self Purification of Streams, Policy of Stream Protection, Governmental Control versus Coöperative Effort.

The second lecture was entitled "Philosophy of Sanitation" and dealt with the Relation of Sanitation to Health and Life; Public and Personal Health; Hygiene, sanitation, and preventive medicine; Vital Statistics; Public Sanitation; Special Fields of Sanitation; Moral value of Sanitation; Relation of Sanitation to Beauty; Economic Value of Sanitation; Sanitation and World Peace.

# RESEARCH PUBLICATIONS

Contents of the research publications of the University during the period covered by this bulletin are as follows:

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## STUDIES IN PHILOLOGY

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Campbell, Killis—The Relation of Poe to His Times.
More, Paul Elmer—A Note on Poe's Method.
Foerster, Norman—Quantity and Quality in Poe's Aesthetic.
Erskine, John—Whitman's Prosody.
Holloway, Emory—Whitman as Critic of America.
Reviews.
Mabbott, Thomas Oliver—*Edgar A. Poe, A Psychopathic Study,* by John W. Robertson.
Holloway, Emory—*A Concise Bibliography of Walt Whitman,* by Carolyn Wells and Alfred F. Goldsmith.
Neilson, William Allan—*Nature in American Literature,* by Norman Foerster.
Hibbard, C. A.—*Some Personal Letters of Herman Melville and a Bibliography,* by Meade Minnigerode.

### VOLUME XX, 4—OCTOBER, 1923

Shackford, Martha Hale—The Magi in Florence: An Aspect of the Renaissance.
Croll, Morris W.—Music and Metrics: A Reconsideration.
Graves, Thornton S.—Some Pre-Mohock Clansmen.
Hotson, J. Leslie—George Jolly, Actor-Manager: New Light on the Restoration Stage.
Gilbert, Allan H.—The Outside Shell of Milton's World.
Hinton, James—Notes on Walter Map's "De Nugis Curialium."
Graves, Thornton S.—Some Chaucer Allusions (1561-1700).
Patch, H. R. and Menner, Robert—Bibliography of Middle English Dialects.
Greenlaw, Edwin—Recent Studies in the History of Thought.

### VOLUME XXI, 1—JANUARY, 1924

Rollins, Hyder E.—An Analytical Index to the Ballad-Entries (1557-1709) in the Registers of the Company of Stationers of London.
Introduction.
Bibliography.
I. Index of Titles.
II. Index of First Lines.
III. Index of Names and Subjects.

### VOLUME XXI, 2—APRIL, 1924

Lindsey, Edwin S.—The Music of the Songs in Fletcher's Plays.
Law, Robert Adger—The "Shoemakers' Holiday" and "Romeo and Juliet."
Graves, Thornton S.—Ralph Crane and the King's Players.

Padelford, Frederick M.—The Allegory of Chastity in "The Faerie Queene."
Nicolson, Margaret Erskine—Realistic Elements in Spenser's Style.
Bredvold, Louis I.—Milton and Bodin's "Heptaplomeres."
Graves, Thomnton S.—Recent Literature of the English Renaissance.

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## THE NORTH CAROLINA LAW REVIEW

### ARTICLES

VOLUME II, 1—December, 1923

Magna Carta and Trial by Jury, by Walter Clark.

Is There a Republican Form of Government?, by William Whatley Pierson, Jr.

VOLUME II, 2—February, 1924

Judicial Review of the North Carolina Corporation Commission, by Charles L. Nichols.

VOLUME II, 3—April, 1924

Evolution of Law in North Carolina, by William J. Adams.

Port Administration and the Law, by Edmund Brown, Jr.

Some Problems in the Legal Status of Unionism, by Willard E. Atkins and Reed Kitchen.

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## THE JOURNAL OF SOCIAL FORCES

### ARTICLES

VOLUME I, 5—September, 1923

The Scientific Scrutiny of Social Facts, by Franklin H. Giddings.

The School as a Means of Developing a Social Consciousness and Social Ideals in Children, by John Dewey.

The Social Responsibility of the State University, by Harry Woodburn Chase.

Problems and Dangers of the School and Education, by William H. Kilpatrick.

The Reorganization of Education in the United States, by John J. Tigert.

Law and Morals. II. The Analytical View, by Roscoe Pound.

VOLUME II, 1—November, 1923

"Issachar Is a Strong Ass", by Gerald W. Johnson.

Rural Life in American Art, by Charles J. Galpin.

Rural Standards of Living in the South, by Roland M. Harper.

The City-Drift of Population in Relation to Social Efficiency, by R. Clyde White.

The Church and the Country Life Movement, Warren H. Wilson.

The Rise of the Rural Life Problem, by Carl C. Taylor.

Psychic Mechanisms and Social Radicalism, by Ellery Francis Reed.

VOLUME II, 2—January, 1924

The Classification of Societal Facts, by Franklin H. Giddings.

History and Social Intelligence, by Harry Elmer Barnes.

Walter Hines Page, a Southern Nationalist, by R. D. W. Connor.

The Dynamics of Population, by Howard B. Woolston.

Community Disorganization, by Jesse F. Steiner.

Barriers to Common Action, by Phillips Bradley.

Group Organization: Trade Unionism, by Willard E. Atkins.

Defensive Harmony, by C. Walker Hayes.

VOLUME II, 3—March, 1924

Robert E. Lee: An Interpretation, by Woodrow Wilson.

Scientific Methods of Studying Human Society, by Charles A. Ellwood.

William Jennings Bryan as a Social Force, by Malcolm M. Willey, Stuart A. Rice.

The Rise of Educational Sociology, by Frederick R. Clow.

The Mill Village Complex: I. The Cotton Mill Village: A Viewpoint, by M. W. Heiss; II. Does the Mill Village Foster a Social Type?, by Jeanette Nichols.

The Reconstruction of Humanism, by George B. Logan.

VOLUME II, 4—May, 1924

The Pluralistic Field and the Sample, by Franklin H. Giddings.

Roads to Social Peace: I, by Edward Alsworth Ross.

Southern Pioneers: IV. Charles Brantley Aycock, by Edwin A. Alderman.

Relation of Layman and Expert in Social Work, by Joseph C. Logan.

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Functional Democracy, by Arthur Wallace Calhoun.

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